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EDGAR R. WAITE, F.L.S., C.M.Z.S.  
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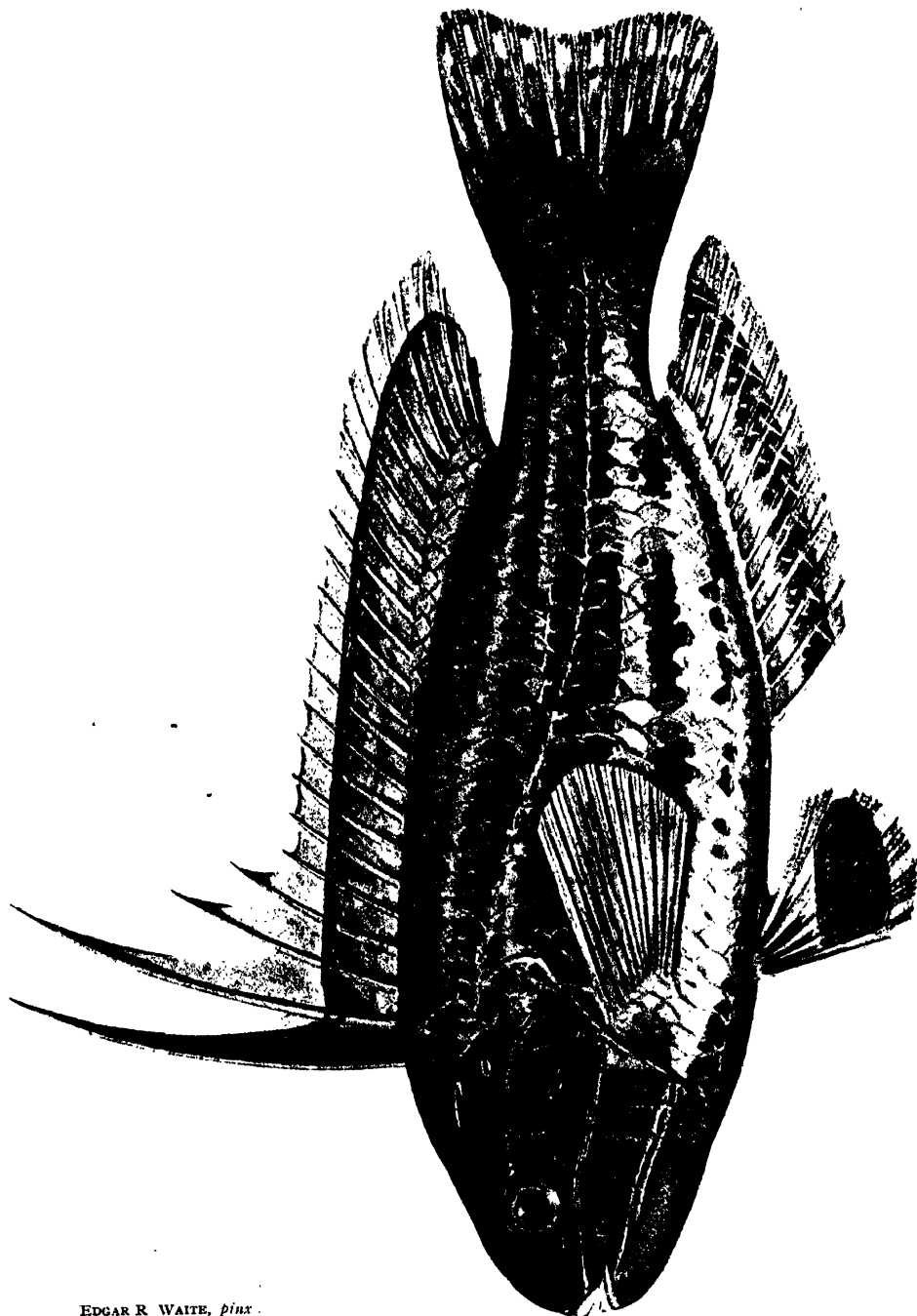
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EDGAR R. WAITE, pinx.

*HETEROSCARUS FILAMENTOSUS* Cast.

# CATALOGUE OF THE FISHES OF SOUTH AUSTRALIA.

By EDGAR R. WAITE, F.L.S., DIRECTOR SOUTH AUSTRALIAN MUSEUM.

Plate i and Text fig. 1—332.

THE primary object of the catalogue is to record the present state of our systematic knowledge of the fishes found in the seas and fresh waters of South Australia. In doing this, however, it is recognized that the list is a mere foundation, known to be incomplete, but supplied as a basis upon which to build. Examination of much material and consequent revision of the catalogue, as it now stands, will be necessary, but were publication to be withheld until this is accomplished, the list could not be issued for many years to come. The want of a key to the literature of our fishes is a deterrent to would-be students, who might otherwise feel inclined to take up the study: to such the list will be useful and an incentive. The angler desires to know more than the fisherman's names of his spoils; to him the illustrations, and through them references to literature, will be appreciated and may lead to a wider view of the subject. The interest evinced in this catalogue by officers in the Department of Fisheries indicates that the production will be welcomed by professional fishermen, and though a more popular publication would naturally be preferred by the public generally, it is hoped that the illustrations and accompanying remarks will be appreciated by those to whom the subject of fish is one of utilitarian, rather than of strictly scientific import.

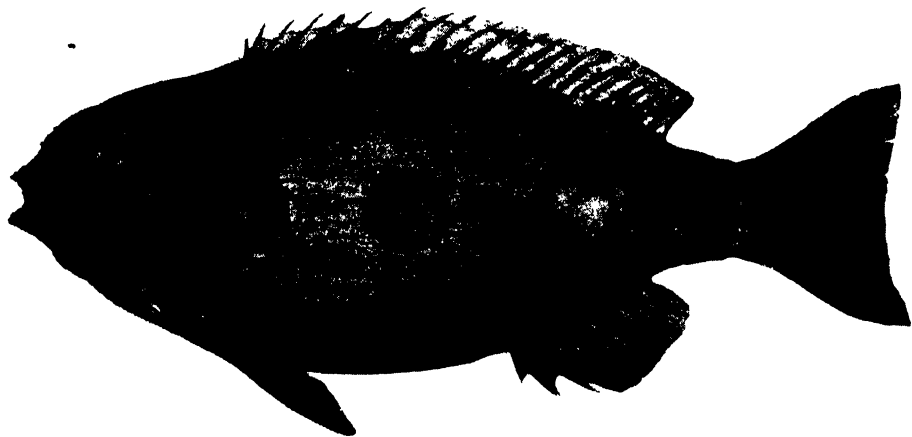
As indicated by the title, the list is confined to an enumeration of the fishes known from the State of South Australia, as politically defined: it therefore includes species recorded from the Great Australian Bight. The western border of the State is the 129th meridian of East longitude, but as it would scarcely be practicable to extend this limit to the ocean, the fishes recorded from the whole of the Bight (the littoral of Western Australia excepted) have been included.

Hemmed in as South Australia is, and possessing only a southern seaboard, the marine fauna is conspicuous by the absence of tropical forms, which to a greater or lesser extent occur on the shores of other continental States. Some of the species included in the catalogue are certainly nominal only, but, on the other hand, many remain to be defined, and it is hoped that the publication of the list, imperfect though it is, may be the means of stimulating interest and thus



increasing our knowledge of the subject. Workers on the fish fauna of South Australia, present or prospective, will in the course of their reading come across species accredited to South Australia that do not appear in this catalogue. The Zoological Record, for example, for the year 1872, compiled by Dr. Günther, furnishes several such instances. In that year Klunzinger<sup>(1)</sup> published a paper under the title, "Zur Fischfauna von Süd-Australien." A glance at the localities supplied shows that the translation should have been Southern Australia, but Günther rendered it as South Australia, which has, of course, a definite and restricted meaning. All the localities given by Klunzinger are Victorian, hence the species therein listed, unless otherwise supported, are not to be included in the fauna of South Australia. Günther also used South Australia in a similar sense in his own writings, and species therefor included by others do not appear in this catalogue. Such, for example, is *Melambaphes nigroris*, which was defined in a paper bearing the title "On New Species of Fishes from Victoria, South Australia" <sup>(2)</sup>.

It is well known that many of the species named by Castelnau are ill-founded, but as the descriptions are for the most part meagre, the recognizable ones often inaccurate, and the types, if existing, not accessible, there is little hope of ascertaining the status of several such species named by this author.



Illustrating Count Castelnau's method of taxidermy.

It may be of interest to describe the method employed by Count Castelnau to preserve the larger of his specimens. One side of the fish was skinned and, the rather more than half skin, was tacked on to a piece of board, cut more or

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(1) Klunzinger, Arch. f. Naturg., xxxviii, 1872, p. 17-47, pl. ii.

(2) Günther, Ann. Mag. Nat. Hist. (3), xi, 1863, p. 115.

less accurately to the shape of the specimen. The space between the skin and the board was stuffed with sawdust through holes previously cut in the board; the holes were then filled with cotton wadding to prevent the sawdust escaping. The process was usually completed by pasting a piece of newspaper over the board, thus keeping the wadding in place. A glass eye was fixed in the orbit of the show side and the specimen generously varnished. The accompanying illustration is from an example of *Tephrocaps zebra*, so treated and preserved, with some others, in this Museum.

The Government has assisted the publication of the catalogue, financially, and, at the instance of the Department of Fisheries and Game, asked that its scope should be extended to interest a larger number of users than would obtain if the list were restricted to purely systematic records. To this end the number of illustrations has been greatly increased. It was originally intended to supply, as far as possible, a figure of a representative species of each genus; as it now stands all species of which a useable picture could be obtained are illustrated. These illustrations will assist in arriving at an approximate disposition in the system of any specimen obtained; they must not, however, be relied upon for absolute determinations; important features, such as the nature of the teeth and squamation and certain comparative dimensions not being indicated. First choice of illustrations has been made from the published drawings by Mr. A. R. McCulloch and myself, either jointly or separately; photographs of casts made in the Museum by the formator, Mr. Robert Limb, under my supervision, and coloured by Mr. G. A. Barnes, have also been used, but the bulk of the figures are culled from illustrations which have appeared in scientific literature published in different parts of the world, the source of which will generally be found in the references to the species to which they are assigned.

To meet the requirements of the public, as represented by the Fisheries Department, short explanatory notes are appended to the entries of many of the species, especially such as are used for food.

I have also been asked to supply "common names" for the fishes; where such names exist, these are given: many fishes, however, have no such names, for some of these more or less appropriate ones have been furnished. The edible fishes have, naturally, been named by the public, but such names vary greatly in the different States, and Mr. D. G. Stead has written a pamphlet "On the need for more uniformity in the vernacular names of Australian Edible Fishes."<sup>(3)</sup> Where known, the aborigines' names of fishes have been furnished, and some of these, as for example "Mulloway" for the Butter-fish (*Sciaena antarctica*),

• (3) Stead, Publications, Fisheries Branch, N.S.W., 1911, 12 p.

are even more commonly used than their English cognomens. The contractions "syn." and "ref." appended to some of the entries denote that further synonymy or references will be found in the publications so indicated. Slight differences in spelling names in the synonymy have not necessarily been observed; for example, separate entries are not made for *Cheilodactylus* and *Chilodactylus*. The dates supplied are, so far as it has been possible to ascertain them, those of actual publication; for example, the Report of the British Association for the year 1842 was published in 1843; references to species recorded in this volume are therefore dated 1843.

The catalogue has been reprinted, or rather duplicated, for the State Department of Fisheries and Game, with identical pagination and date of publication, the only deviation from the original being the substitution of the special title page issued with the copies printed for the Department.

One cannot, of course, study the fishes of any given area without knowing what has been done elsewhere, but for present purposes it must suffice to indicate the principal systematic works that have been published in Australasia.

The completion, in 1870, of Dr. Albert Günther's monumental work<sup>(4)</sup> provided a stimulus for the preparation of local catalogues.

**New Zealand.** The first to appear was Captain F. W. Hutton's catalogue<sup>(5)</sup> issued in 1872, followed, in 1893, by Dr. Theodore Gill's "Comparison of Antipodal Faunas"<sup>(6)</sup>. In 1904 Hutton produced another list<sup>(7)</sup>. The latest published catalogue, issued in 1907, is "A Basic List of the Fishes of New Zealand," by Edgar R. Waite<sup>(8)</sup>.

**Australia.** Sir William Macleay's "Descriptive Catalogue of Australian Fishes"<sup>(9)</sup> was published in 1880, 1881, and was closely modelled on Günther's work, but original observations and descriptions were introduced.

**Tasmania.** The fishes of Tasmania were included in Macleay's catalogue, above mentioned, but in 1883 they were separately listed by R. M. Johnston, under the title "General and Critical Observations on the Fishes of Tasmania"<sup>(10)</sup>, which list, as in the case of some of the other works recorded, was later revised.

**New South Wales.** In 1886 J. Douglas Ogilby<sup>(11)</sup> published the first catalogue restricted to the fishes of the State. In 1904 Waite issued a list under

(4) Günther, Cat.-Fish. Brit. Mus., i-viii, 1859-1870.

(5) Hutton, Fishes of New Zealand: Catalogue with diagnoses of the species, 1872.

(6) Gill, Nat. Acad. Sciences, Wash., vi, 1893.

(7) Hutton, Index Faunae Novae Zealandiae, 1904.

(8) Waite, Rec. Cant. Mus., i, 1907, 1912.

(9) Macleay, Proc. Linn. Soc. N.S.Wales, v, 1880; vi, 1881; ix, 1884.

(10) Johnston, Pap. and Proc. Roy. Soc. Tasm., 1883, 1891.

(11) Ogilby, Catalogue of the Fishes of N.S.Wales with their principal synonyms, 1886.

the title "Synopsis of the Fishes of New South Wales" <sup>(12)</sup>. This, in turn, is to be superseded by an "Illustrated Check-list," by Allan R. McCulloch <sup>(13)</sup>, of which a first part appeared in 1919.

**Victoria.** The only list of Victorian fishes extant was produced by A. H. S. Lucas in 1880, under the title "A Systematic Census of Indigenous Fish, hitherto recorded from Victorian Waters" <sup>(14)</sup>.

**Queensland.** The publication of a "Check-list of the Cephalochordates, Selachians and Fishes of Queensland" has been undertaken by Ogilby <sup>(15)</sup>, but so far one part only, published in 1916, and dealing with the *Protochordata Marsipobranchii* and *Isospondyli*, has appeared. I understand it is doubtful if the state of my old colleague's health will permit him to continue the work.

**South Australia.** The present catalogue is the first completed list of the fishes of South Australia to be published, though one previous attempt is to be chronicled. In 1908, 1909, A. H. C. Zietz issued three parts under the title, "A Synopsis of the Fishes of South Australia" <sup>(16)</sup>. The *Leptocardii*, *Cyclostomata* and portion of the *Teleostei* were included.

**Western Australia.** A bare list of the fishes of this State, compiled by Bernard H. Woodward, was published in 1902 <sup>(17)</sup>.

**General subject.** Though not confined to strictly systematic records, the following publications may be mentioned:

R. A. A. Sherrin, Handbook of the Fishes of New Zealand, 1886.

J. E. Tenison Woods, Fish and Fisheries of New South Wales, 1883.

J. Douglas Ogilby, Edible Fishes and Crustaceans of New South Wales, 1893.

F. G. Afalo, A Sketch of the Natural History of Australia, 1896.

David G. Stead, Fishes of Australia, 1906.

David G. Stead, Edible Fishes of New South Wales, 1908.

T. G. Roughley, Fishes of Australia and their Technology, 1916.

The publications of scientific Societies and Institutions in many parts of the world contain articles on Australian fishes, and references to most of these will be found in the text.

**ACKNOWLEDGMENTS.** I am indebted to the Trustees of the Australian Museum for lending books and the beautiful drawings made, in illustration of

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(12) Waite, Mem. N.S.Wales Nat. Club, No. 2, 1904.

(13) McCulloch, Aust. Zoologist, i, 1919.

(14) Lucas, Proc. Roy. Soc. Vict. (n.s.), ii, 1890.

(15) Ogilby, Mem. Queensl. Mus., v, 1916.

•(16) Zietz, Trans. Roy. Soc. S. Aust., xxxii, 1908; xxxiii, 1909.

(17) Woodward, Western Australian Year Book, 1902.

Mr. McCulloch's papers, either by himself or Miss Phyllis Clarke; to the Director of the National Museum, Melbourne, for the loan of books, and to my Assistant, Mr. Herbert M. Hale, for taking the photographs of the casts of fishes in this Museum and for much general help.

#### INTRODUCED FISHES.

A number of exotic fishes have been introduced into South Australia; the majority are kept in private tanks and aquaria and need not be enumerated. Five species, however, have been liberated for economic purposes, and are firmly established as denizens of our fresh waters; they are:

Gold Carp (*Carassius auratus* Linn.). Asia, via Europe.

Tench (*Tinca tinca* Linn.). Europe.

Perch (*Perca fluviatilis* Linn.). Europe.

Brown Trout (*Salmo trutta* Linn.). Europe.

Rainbow Trout (*Salmo irideus* Gibbons). California.

All of these, excepting the Carp, were intentionally introduced into South Australia. The Trout were placed in the various reservoirs, and have thriven immensely; a Brown Trout was recently caught measuring 2' ft. 10½ in. in length. The Carp were originally introduced into Victoria, and entered our waters by way of the River Murray. I have seen hundreds of thousands of them taken from the irrigation drains and loaded into carts, but Adelaide did not receive a single fish, most of them being railed to Melbourne, where selling prices are higher than even in Adelaide. In consequence of this, the majority of our inland fishes are sent to the Victorian capital, and large numbers of marine species also, the exceptions being from such places as are within easy reach of our city.

E. R. W.

South Australian Museum,  
Adelaide, 21st February, 1921.

# THE FISHES OF SOUTH AUSTRALIA

## KEY TO THE DESIGNATIONS OF FISH-LIKE VERTEBRATES.

- a. No localized brain, no protective skull, no heart . . . . . **ACRANIA**  
(Lancelets)
- aa. Anterior end of central nervous axis developed  
into a brain and protected by a skull, heart  
present . . . . . **CRANIATA**  
(Lampreys, Fishes and  
higher Vertebrates)
- b. Nostril single, median; no mandible, no  
limbs or limb-girdles . . . . . **CYCLOSTOMATA**  
(Lampreys)
- bb. Nostrils paired; mandible, limb-girdles and  
limbs usually present, developed as rayed  
fins, gills persistent . . . . . **PISCES** (Fishes)

## ACRANIA (LANCELETS).

### FAMILY BRANCHIOSTOMIDAE.

#### **EPIGONICHTHYS** Peters, 1876 (cultellus).

#### **EPIGONICHTHYS BASSANUS** Günther (Southern Lancelet).

*Branchiostoma bassanum* Günth., Voy. Alert, Zool., 1884, p. 31.

*Heteropleuron bassanum* Kirkaldy, Q.J.M.S., xxxvii (n.s.), 1895, p. 314, pl. xxxiv,  
fig. 6.



Fig. 1\*. *Epigonichthys bassanus*.

This and the following species are small transparent marine animals, occurring near the shore and burrowing in the sand.

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\* The numbers of the illustrations are not necessarily consecutive, but represent the sequence of the species.

**EPIGONICHTHYS AUSTRALIS** Raff (S. Australian Lancelet).

*Asymmetron australis* Raff, Endeavour Res., i, 1912, p. 303, pl. xxxvii, fig. 1-7 (structure).

**CRANIATA.****CLASS CYCLOSTOMATA (LAMPREYS).**

- a. A single median suproral lamina, developed from the upper arch of the annular cartilage, mouth fringes present . . . . . PETROMYZONIDAE
- aa. Two distant lateral laminae developed, mouth fringes rudimentary . . . . . CARAGOLIDAE

**FAMILY PETROMYZONIDAE.****GEOTRIA** Gray, 1851 (australis).**GEOTRIA AUSTRALIS** Gray (Wide-mouthed Lamprey).

*Geotria australis* Gray, Chondropt., 1851, p. 142, pl. ii and P.Z.S., 1851, p. 239, pl. iv, fig. 3 and pl. v; Ogil, P.L.S., N.S.W., xxi, 1896, p. 422.

*Geotria allportii* Günth., P.Z.S., 1871, p. 675, pl. lxx.



Fig. 3. *Geotria australis*.

Lampreys are eel-shaped animals which undergo a metamorphosis; in the earlier stages the eyes are rudimentary and teeth are entirely absent. When adult these parasites attach themselves to fishes and rasp off the flesh by means of the horny teeth with which the circular mouth is provided. Some examples, at least, of the Wide-mouthed Lamprey, develop a throat pouch, as illustrated.

FAMILY CARAGOLIDAE.

**CARAGOLA** Gray, 1851 (*lapicida*).

**CARAGOLA MORDAX** Richardson (Short-headed Lamprey).

*Petromyzon mordax* Rich., Zool. Ereb. and Terr., 1848, p. 62, pl. xxxviii, fig. 3-6.

*Mordacia mordax* Gray, Chondropt., 1851, p. 144, pl. i, fig. 6 and P.Z.S., 1851, p. 240, pl. iv, fig. 6 (mouth); Ogil., P.L.S., N.S.W., xxi, 1896, p. 400.

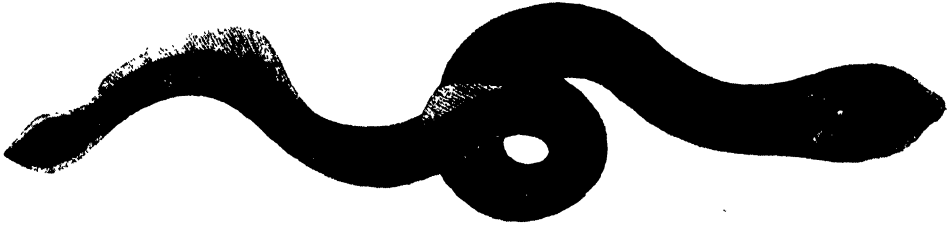


Fig. 4. *Caragola mordax*.

Before the construction of the weir this lamprey was very common in the River Torrens, which it ascended for breeding purposes; it is occasionally washed up on the ocean beaches.

CLASS PISCES (FISHES).

- a. Skeleton cartilaginous, skull without membrane bones (opercles, suborbital ring, etc.); males with paired claspers.
  - b. Gills with five to seven separate external openings . . . . . ELASMOBRANCHII  
(Sharks and Rays)
  - bb. Gills with a single external opening . . . . . HOLOCEPHALI  
(Elephant Fishes)
- aa. Skeleton usually bony, skull with membrane bones; males without paired claspers . . . . . TELEOSTOMI  
(True Fishes)

SUB-CLASS ELASMOBRANCHII (SHARKS AND RAYS).

- a. Gill-openings on the sides; pectorals free from the head . . . . . SELACHII  
(Sharks)
- aa. Gill-openings on the lower surface; pectorals attached to the head; no anal fin . . . . . BATOIDEI  
(Rays)



**ORDER SELACHII (SHARKS).****FAMILY HEXANCHIDAE.****NOTORHYNCHUS** Ayres, 1855 (*maculatus*).**NOTORHYNCHUS PECTOROSUS** Garman (Seven-gilled Shark).

*Hepttranchus indicus* Macdon. & Barr., P.Z.S., 1868, p. 371, pl. xxxiii.

*Notidanus indicus* Hutt., Cat. Fish. N.Z., 1872, p. 79; McCoy, Prod. Zool. Vict., dec. v, 1880, pl. xliii, fig. 2.

*Hepttranchias pectorosus* Garm., Bull. Essex Inst., xvi, 1884, p. 56.

*Hepttranchias haswelli* Ogil., P.L.S., N.S.W., xxii, 1898, p. 62.

*Notorhynchus indicus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 5.

*Notorhynchus pectorosus* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 20 (syn.).

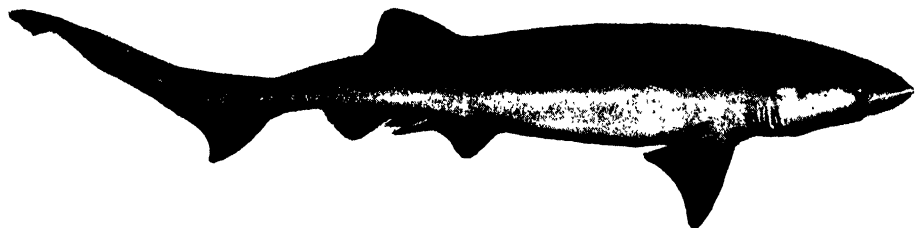


Fig. 5. *Notorhynchus pectorosus*.

Most sharks and rays have five gill slits; this species and some of its allies have seven slits, also a single fin only on the back. The teeth likewise are most characteristic, and are dissimilar in each jaw.

**FAMILY HETERODONTIDAE.****HETERODONTUS** Blainville, 1816 (*philippi*).**HETERODONTUS PHILIPPI** Bloch & Schneider (Port Jackson Shark).

*Squalus philippi* Bl. & Schn., Syst. Ichth., 1801, p. 134.

*Heterodontus philippi* Blainv., Bull. Soc. Phil., 1816, p. 121; McCoy, Prod. Zool. Vict., dec. xii, 1886, pl. cxiii.

*Cestracion philippi* Less., Voy. Coquille, Zool., ii, 1830, p. 97, pl. ii; Waite, J.L.S., xxv, 1896, p. 325, pl. xii, fig. 1, 2 (egg); Saville Kent, Nat. in Aust., 1897, p. 192, fig.

*Centracion philippi* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 182 (ref.).

Sometimes called a living fossil, existing forms being but little different from species living in Palaeozoic ages. The crushing teeth are arranged obliquely and

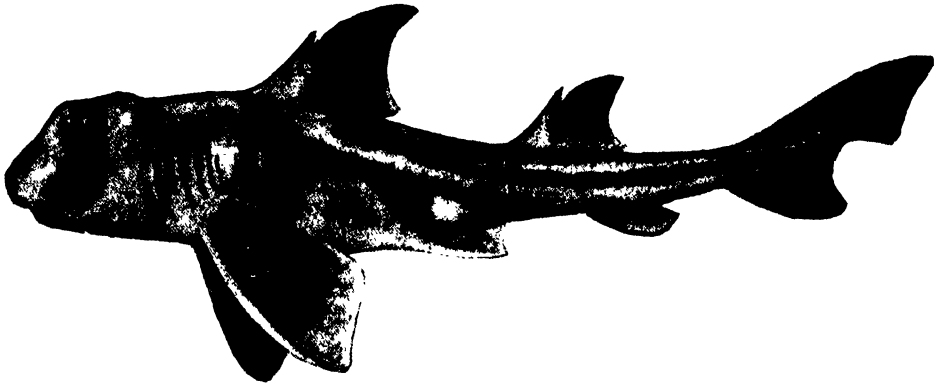


Fig. 6. *Heterodontus philippi*.

are often stained with colour from the spines of sea urchins: the egg-cases are formed of a double spiral.

#### FAMILY CARCHARINIDAE.

**CARCHARINUS** Blainville, 1816 (*commersoni*).

**CARCHARINUS GANGETICUS** Müller & Henle (Sea Shark).

*Carcharias gangeticus* Müll. & Henle, Plagiost., 1838, p. 39, pl. xiii; Day, Fish. India, 1878, p. 715, pl. clxxxvii, fig. 1.

*Carcharinus gangeticus* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 139.

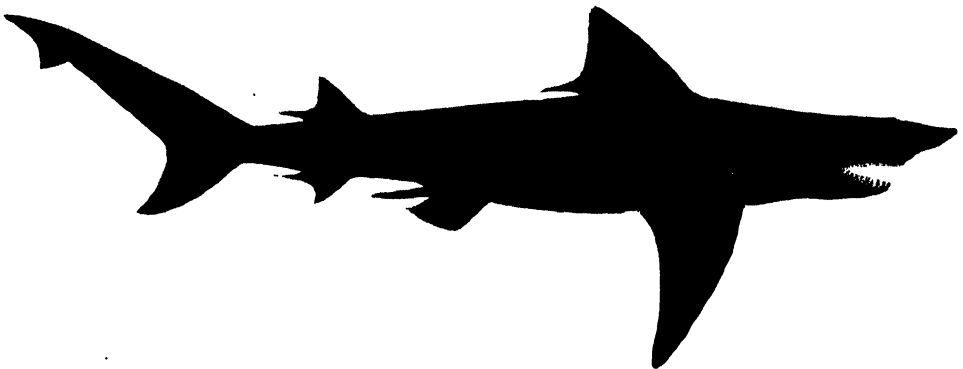


Fig. 7. *Carcharinus gangeticus*.

Though known from Australian seas, this species is much more common in Indian waters, where it attains to nine feet in length. It is one of the most ferocious of Indian sharks and frequently attacks bathers, even in the Hoogly at Calcutta.

**CARCHARINUS BRACHYURUS** Günther (Whaler).

*Carcharias brachyurus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 369; Waite, Rec. Aust. Mus., vi, 1906, p. 226, pl. xxxix.

*Carcharias macrurus* Rams. & Ogil., P.L.S., N.S.W. (2) ii, 1888, p. 163.



Fig. 8. *Carcharinus brachyurus*.

The name "Whaler" is said to have been bestowed by the whale fishers of Twofold Bay, N.S.W., from the circumstance that it is this shark that usually appears during the whaling operations there carried on.

**HYPOPRION** Müller & Henle, 1838 (*macloti*).**HYPOPRION HEMIODON** Müller & Henle.

*Carcharias hemiodon* Müll. & Henle, Plagiost., 1838, p. 35, pl. xix (teeth); A. Zietz, T.R.S., S.A., x, 1888, p. 303.

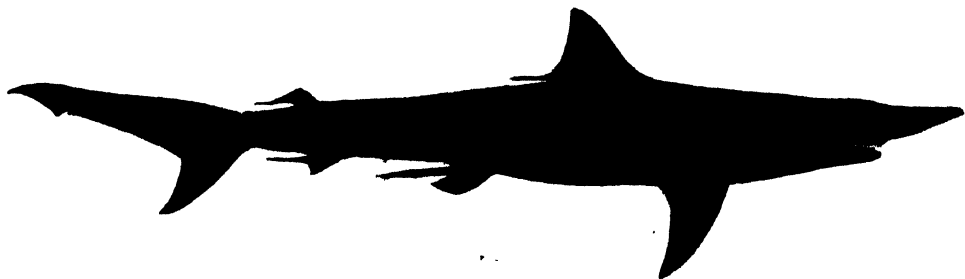


Fig. 9. *Hypoprion macloti*.

The figure is of *Hypoprion macloti*, an allied species, the type of the genus.

**PRIONACE** Cantor, 1849 (*glaucus*).**PRIONACE GLAUCUM** Linnaeus (Blue Shark).

*Squalus glaucus*, Linn., Syst. Nat. (ed. x), 1758, p. 235.

*Prionace glauca* Jord. & Everm., Bull. 47, U.S. Nat. Mus., i, 1896, p. 33 and iv, 1900, pl. iv, fig. 16.

*Galeus glaucus* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 145, pl. iii, fig. 1-3 (syn.).

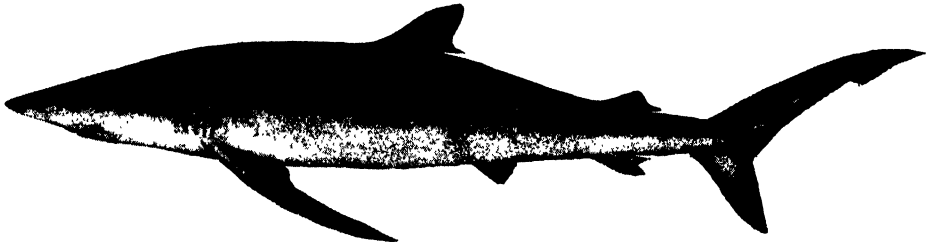


Fig. 10. *Prionace glaucum*.

Not common in Southern Australian waters, but examples from South Australia are preserved in the Museum.

**GALEOCERDO** Müller & Henle, 1837 (arcticus).

**GALEOCERDO ARCTICUS** Faber (Tiger Shark).

*Squalus arcticus* Faber, Fischer Islands, 1829, p. 17.

*Galeocerdo arcticus* Müll. & Henle, Arch. f. Naturg., iii, 1837, p. 308.

*Galeocerdo tigrinus* and *G. arcticus* Müll. & Henle, Plagiost., 1837, p. 59, 60, pl. xxiii, xxiv.

*Galeocerdo rayneri* Macdon. & Barr., P.Z.S., 1868, p. 368, pl. xxxii; Day, Fish. India, 1878, p. 718, pl. clxxxvii, fig. 3.

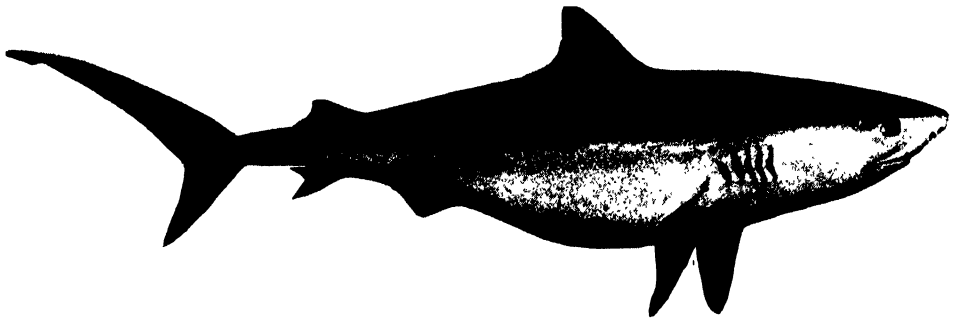


Fig. 11. *Galeocerdo arcticus*.

Attains to a length of sixteen feet, and is said to be "the most cunning and ferocious of all the scourges of the sea."

**GALEUS** Rafinesque, 1810 (galeus).

**GALEUS AUSTRALIS** Macleay (School Shark).

*Galeus australis*, MacL., P.L.S., N.S.W., vi, 1881, p. 354; McCoy, Prod. Zool. Viet., dec. vii, 1882, pl. lxiv, fig. 2; Waite, Rec. Cant. Mus., i, 1909, p. 139, pl. xv •(young).

*Galeorhinus australis* Hutt., Index Faunae N.Z., 1904, p. 54.

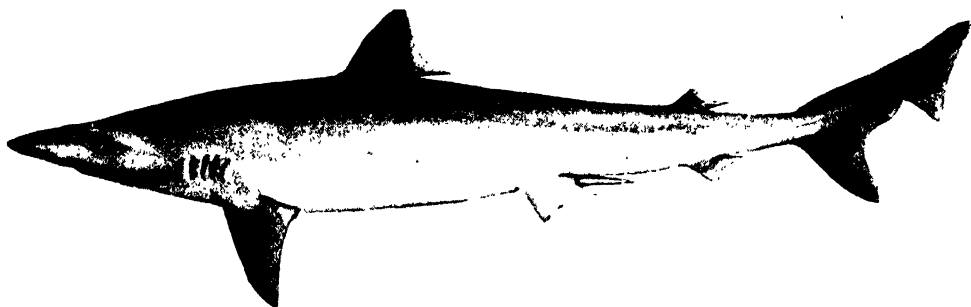


Fig. 12. *Galeus australis*.

A very common and prolific species, as many as fifty living young being produced, which accompany the mother for some time after birth.

#### FAMILY MUSTELIDAE.

##### **MUSTELUS** Linck, 1790 (*mustelus*).

##### **MUSTELUS ANTARCTICUS** Günther (Gummy or Sweet William).

*Mustelus antarcticus* Günth., Cat Fish. Brit. Mus., viii, 1870, p. 387; Parker, T.N.Z. Inst., xv, 1883, p. 219, pl. xxx (embryos); McCoy, Prod. Zool. Viet., dec. ix, 1884, pl. lxxxvii; McCull., Rec. Aust. Mus., vii, 1909, p. 315, pl. xe, fig. 3.

*Galeus antarcticus* Waite, Rec. Aust. Mus., iv, 1902, p. 175, fig. 19 (foetus and shell-gland).



Fig. 13. *Mustelus antarcticus*.

The young are produced alive, each in a separate compartment of the uterus but there is no vascular connection between the foetus and the mother, unlike the remarkable condition occurring in one of the northern species of the genus.

#### FAMILY SPHYRNIDAE.

##### **SPHYRNA** Rafinesque, 1810 (*zygaena*).

##### **SPHYRNA ZYGAENA** Linnaeus (Hammer-headed Shark).

*Squalus zygaena* Linn., Syst. Nat. (ed. x), 1758, p. 234.

*Zygaena lewini* Lord (in Griffith), Anim. King., x, 1834, p. 640, pl. 1.

*Zygaena malleus* Day, Fish. India, 1878, p. 719, pl. clxxxvi, fig. 4; McCoy, Prod. Zool. Viet., dec. vi, 1881, pl. lvi, fig. 1.

*Cestracion zygaena* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 157, pl. i, fig. 1-3 (ref.).

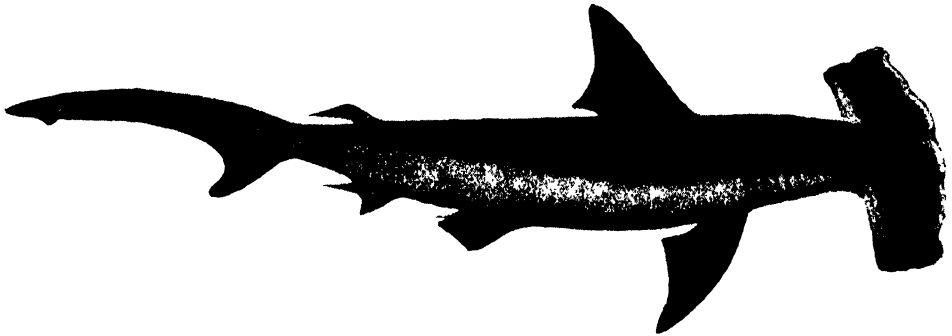


Fig. 14. *Sphyrna zygaena*.

Several species of Hammer-heads are known, but in none is the "hammer" so pronounced as in this one. The Shark grows to a length of fifteen feet. As many as thirty-seven embryos have been taken from a female eleven feet in length.

#### FAMILY ORECTOLOBIDAE.

**ORECTOLOBUS** Bonaparte, 1837 (barbatus).

**ORECTOLOBUS MACULATUS** Bonnaterre (Common Carpet Shark).

*Squalus maculatus* Bonn., Encycl. Meth., Ichth., 1788, p. 8.

*Squalus barbatus* Gmel., Syst. Nat., i, 1789, p. 1493.

*Crossorhinus barbatus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 414; McCoy, Prod. Zool. Viet., dec. v, 1880, pl. xliii, fig. 1.

*Orectolobus maculatus* Ogil. & McCull, P.R.S., N.S.W., xlii, 1908, p. 273, pl. xlii, fig. 2.

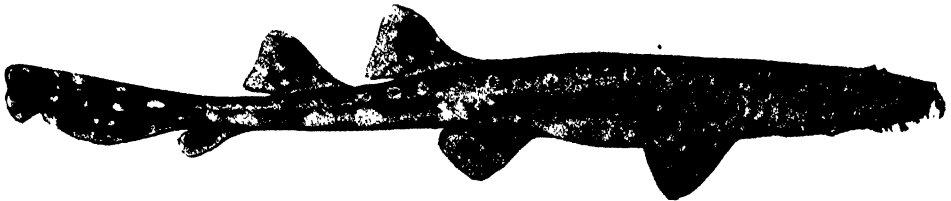


Fig. 15. *Orectolobus maculatus*.

The Carpet Sharks, called Wobbegongs in the Eastern States of Australia, are sluggish bottom-haunting forms, where their remarkable colour patterns doubtless harmonize well with their varied surroundings.

**ORECTOLOBUS DEVISI** Ogilby (Banded Carpet Shark).

*Crossorhinus barbatus* McCoy, Prod. Zool. Viet., dec. v, 1880, pl. xliii, fig. 1 (not Gmel.).

*Crossorhinus ornatus* De Vis, P.L.S., N.S.W., viii, 1883, p. 289 (not Bonap.).

*Orectolobus ornatus* Regan, P.Z.S., 1908, p. 356, pl. xi, fig. 2 (young); Ogil. & McCull., P.R.S., N.S.W., xlii, 1909, p. 276, pl. xlii, fig. 1.

*Orectolobus devisi* Ogil., Mem. Qld. Mus., v, 1916, p. 181.

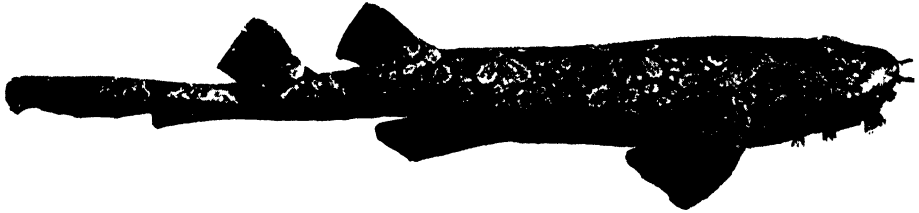


Fig. 16. *Orectolobus devisi*.

The illustration of this beautiful species is from the coloured cast of specimen taken in St. Vincent Gulf: it measures six and a half feet in length.

**ORECTOLOBUS TENTACULATUS** Peters (Sombre Carpet Shark).

*Crossorhinus tentaculatus* Peters, Mon. Akad. Wiss. Berl., 1864, p. 123.

*Orectolobus tentaculatus* Regan, P.Z.S., ii, 1908, p. 357, pl. xii, fig. 2; Ogil. & McCull., P.R.S., N.S.W., xlii, 1908, p. 278.

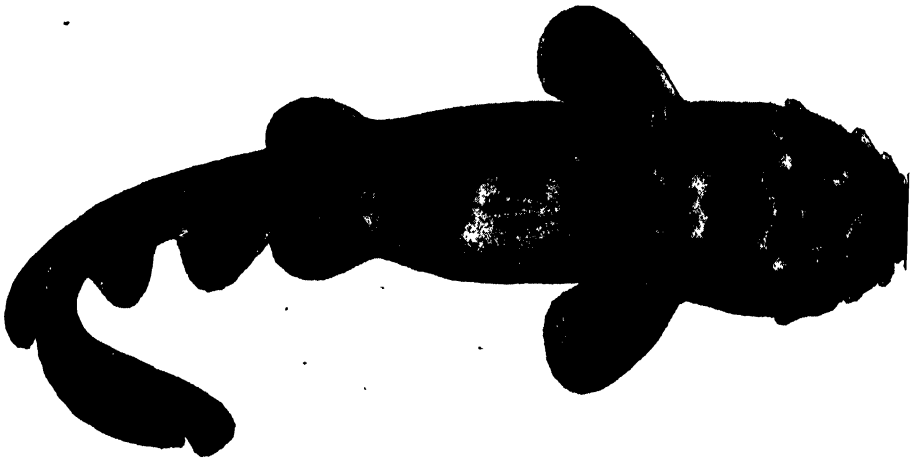


Fig. 17. *Orectolobus tentaculatus*.

This is the least ornate of our three species; the illustration represent young example, in which the dark markings are more conspicuous than in adults.

**PARASCYLLIUM Gill, 1861 (variolum).****PARASCYLLIUM VARIOLATUM Duméril (Cat Shark).**

*Hemiscyllium variolatum* Dum., Rev. & Mag. Zool., 1853, p. 121, pl. iii, fig. 1.

*Parascyllium nuchale* McCoy, Ann. Mag. Nat. Hist. (4), xiii, 1874, p. 15, pl. ii.

*Parascyllium variolatum* Gill, Ann. N.Y. Lyceum, vii, 1861, p. 413; McCull., Endeavour Res., i, 1911, p. 7, pl. ii, fig. 1.

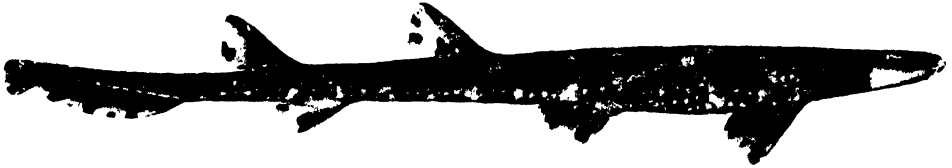


Fig. 18. *Parascyllium variolatum*.

This and allied sharks are small species, seldom attaining to more than three feet in length; they are also known as Dogfishes, but the name "Cat Shark" is useful, as it serves to distinguish them from the "spiny dogs" of the Family Squalidae. The egg-cases of the Cat Sharks resemble those of the rays, familiarly known as "skate-barrows," but are of more elongate shape.

**PARASCYLLIUM FERRUGINEUM McCulloch (Rusty Cat Shark).**

*Parascyllium ferrugineum* McCull., Endeavour Res., i, 1911, p. 7, pl. ii, fig. 2, and text fig. 2; Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 459.



Fig. 19. *Parascyllium ferrugineum*.

Two specimens only are so far known, one from outside Port Philip, Victoria, the other from the Great Australian Bight.

**FAMILY SCYLLIORHINIDAE.****SCYLLIORHINUS Blainville, 1816 (canicula).****SCYLLIORHINUS VINCENTI A. Zietz (Gulf Cat Shark).**

*Scyllium vincenti* Zietz, T.R.S., S.A., xxxii, 1908, p. 287.



**ORECTOLOBUS DEVISI** Ogilby (Banded Carpet Shark).

*Crossorhinus barbatus* McCoy, Prod. Zool. Viet., dec. v, 1880, pl. xliii, fig. 1 (not Gmel.).

*Crossorhinus ornatus* De Vis, P.I.S., N.S.W., viii, 1883, p. 289 (not Bonap.).

*Orectolobus ornatus* Regan, P.Z.S., 1908, p. 356, pl. xi, fig. 2 (young); Ogil. & McCull., P.R.S., N.S.W., xlii, 1909, p. 276, pl. xlii, fig. 1.

*Orectolobus devisi* Ogil., Mem. Qld. Mus., v, 1916, p. 181.

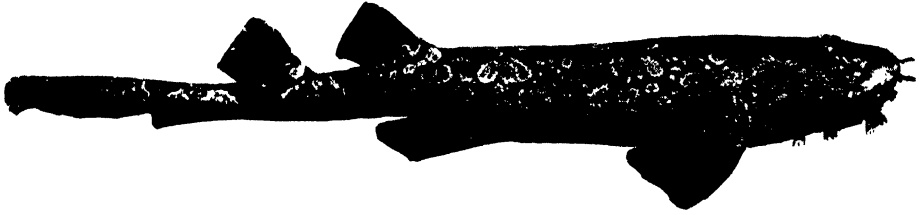


Fig. 16. *Orectolobus devisi*.

The illustration of this beautiful species is from the coloured cast of a specimen taken in St. Vincent Gulf: it measures six and a half feet in length.

**ORECTOLOBUS TENTACULATUS** Peters (Sombre Carpet Shark).

*Crossorhinus tentaculatus* Peters, Mon. Akad. Wiss. Berl., 1864, p. 123.

*Orectolobus tentaculatus* Regan, P.Z.S., ii, 1908, p. 357, pl. xii, fig. 2; Ogil. & McCull., P.R.S., N.S.W., xlii, 1908, p. 278.

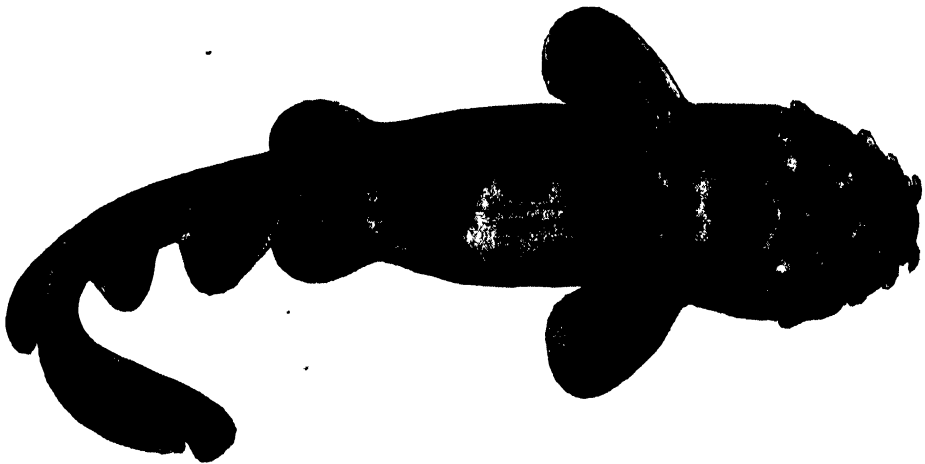


Fig. 17. *Orectolobus tentaculatus*.

This is the least ornate of our three species; the illustration represents a young example, in which the dark markings are more conspicuous than in the adults.

**PARASCYLLIUM Gill, 1861 (variolatum).****PARASCYLLIUM VARIOLATUM Duméril (Cat Shark).**

*Hemiscyllium variolatum* Dum., Rev. & Mag. Zool., 1853, p. 121, pl. iii, fig. 1.

*Parascyllium nuchale* McCoy, Ann. Mag. Nat. Hist. (4), xiii, 1874, p. 15, pl. ii.

*Parascyllium variolatum* Gill, Ann. N.Y. Lyceum, vii, 1861, p. 413; McCull., Endeavour Res., i, 1911, p. 7, pl. ii, fig. 1.



Fig. 18. *Parascyllium variolatum*.

This and allied sharks are small species, seldom attaining to more than three feet in length; they are also known as Dogfishes, but the name "Cat Shark" is useful, as it serves to distinguish them from the "spiny dogs" of the Family Squalidae. The egg-cases of the Cat Sharks resemble those of the rays, familiarly known as "skate-barrows," but are of more elongate shape.

**PARASCYLLIUM FERRUGINEUM McCulloch (Rusty Cat Shark).**

*Parascyllium ferrugineum* McCull., Endeavour Res., i, 1911, p. 7, pl. ii, fig. 2, and text fig. 2; Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 459.



Fig. 19. *Parascyllium ferrugineum*.

Two specimens only are so far known, one from outside Port Philip, Victoria, the other from the Great Australian Bight.

**FAMILY SCYLLIORHINIDAE.****SCYLLIORHINUS Blainville, 1816 (canicula).****SCYLLIORHINUS VINCENTI A. Zietz (Gulf Cat Shark).**

*Scyllium vincenti* Zietz, T.R.S., S.A., xxxii, 1908, p. 287.

*Scylliorhinus vincenti* McCull., Endeavour Res., i, 1911, p. 4, pl. ii, fig. 3 and text fig. 1.

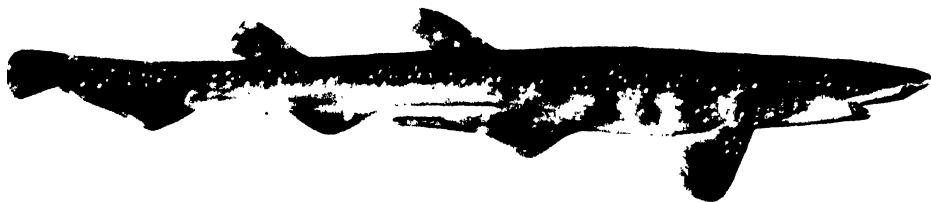


Fig. 20. *Scylliorhinus vincenti*.

A local species, occurring in shallow water and occasionally cast on to the ocean beaches after violent storms.

**HALAELURUS** Gill, 1861 (*burgeri*).

**HALAELURUS ANALIS** Ogilby (Spotted Cat Shark).

*Scyllium maculatum* Rams., P.L.S., N.S.W., v, 1880, p. 97 (not Günth.).

*Scyllium anale* Ogil., P.L.S., N.S.W., x, 1886, p. 445.

*Catulus analis* Waite, Mem. Aust. Mus., iv, 1899, p. 31, pl. ii, fig. 1 and Rec.

Aust. Mus., vi, 1905, p. 228, pl. xl and fig. 38 (egg).

*Halaclurus analis* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 85.

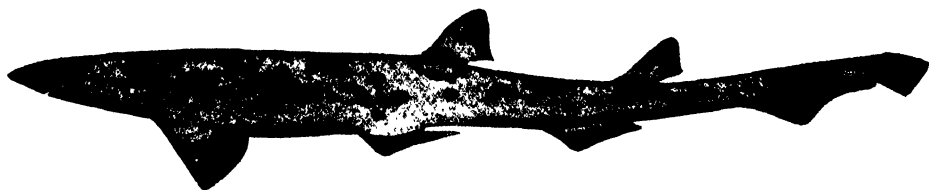


Fig. 21. *Halaclurus analis*.

Occurs in deeper water than the foregoing species, to which fact it doubtless owes its much more extended distribution.

FAMILY ALOPIIDÆ.

**ALOPIAS** Rafinesque, 1810 (*macrourus* = *vulpinus*).

**ALOPIAS VULPINUS** Bonnaterre (Thresher).

*Squalus vulpinus* Bonn., Encycl. Meth., Ichth., 1788, p. 9, pl. lxxxv, fig. 349.

*Alopias vulpes* Day, Fish. Gt. Brit. and Irel., ii, 1884, p. 300, pl. elvii.

*Alopecias vulpes* McCoy, Prod. Zool. Viet., dec. ix, 1884, pl. lxxxviii.

*Vulpecula marina* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 30, pl. vii, fig. 1-3 (syn.).



Fig. 22. *Alopias vulpinus*.

The long tail is employed to thrash the surface of the water around a school of fish so as to cause them to huddle together, in which frightened condition they fall an easy prey to the shark.

#### FAMILY CARCHARIIDAE.

**CARCHARIAS** Rafinesque, 1810 (taurus).

**CARCHARIAS ARENARIUS** Ogilby (Grey Nurse).

*Odontaspis taurus* McCoy, Prod. Zool. Viet., dec. vii, 1882, pl. lxiv, fig. 1 (not Rafin.).

*Carcharias arenarius* Ogil., Ann. Qld. Mus., x, 1911, p. 37.

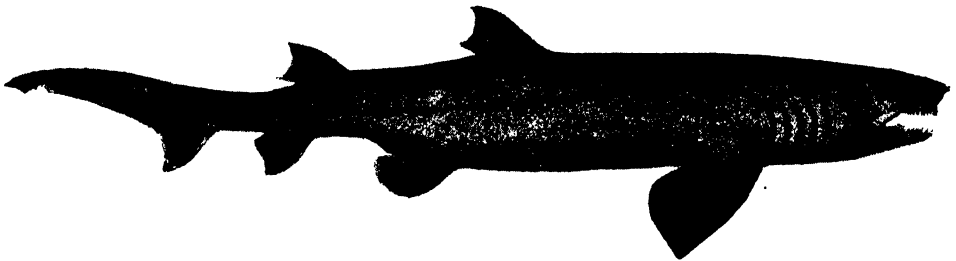


Fig. 23. *Carcharias arenarius*.

Fairly common in our waters, but apparently more so in Victoria, where it devours large quantities of edible fish and is a great terror to bathers.

**CARCHARIAS TRICUSPIDATUS** Day (Blue Nurse).

*Odontaspis americanus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 392.

*Carcharias tricuspidatus* Day, Fish. India, 1878, p. 713, pl. clxxxvi; fig. 1.

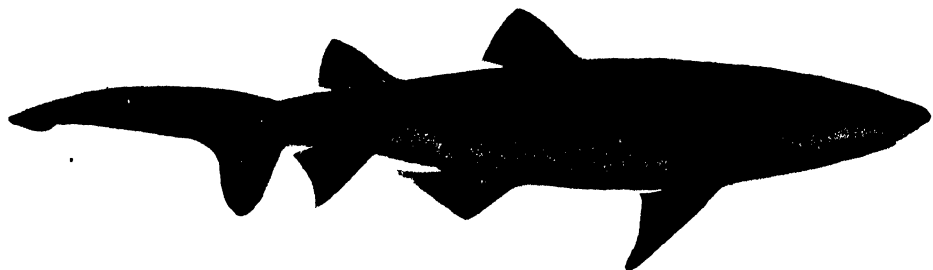


Fig. 24. *Carcharias tricuspidatus*.

Far from common here, but occurs plentifully in Indian seas, where it attains a length of at least twenty feet.

**TRIAKIS Müller & Henle, 1838 (scyllium).**

**TRIAKIS SCYLLIUM Müller & Henle.**

*Triakis scyllium* Müll. & Henle, Plagiost., 1838, p. 63, pl. xxvi; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 166 (ref.).

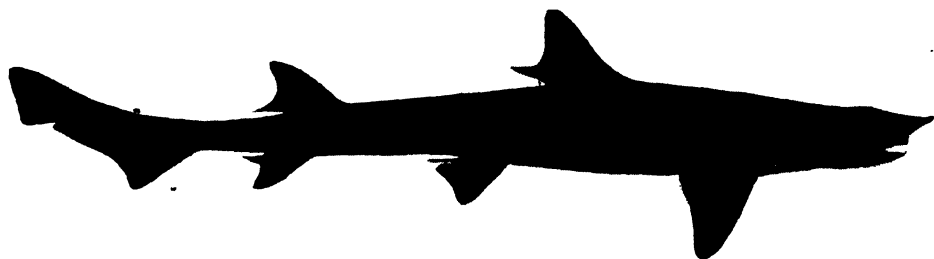


Fig. 25. *Triakis scyllium*.

This species is included on the evidence of a single specimen taken from the Semaphore Jetty in St. Vincent Gulf. It was originally described from Japan, and occurs also in the Indian Ocean.

#### FAMILY MITSUKURINIDAE.

**MITSUKURINA Jordan, 1898 (owstoni).**

**MITSUKURINA OWSTONI Jordan (Elphin Shark).**

*Mitsukurina owstoni* Jord., Proc. Cal. Acad. Sci. (ser. 3), i, 1898, p. 200, pl. xi, xii; A. Zietz, T.R.S., S.A., xxxii, 1908, p. 291.

?*Scapanorhynchus jordan* Huss., Bull. Am. Mus., xxvi, 1909, p. 257, pl. xlv. and text figs.

?*Scapanorhynchus dofleini* Engelh., Zool. Anz., xxxix, 1912, p. 644.



Fig. 26. *Mitsukurina owstoni*.

The size of the spiracle is doubtless variable and can scarcely be regarded as a specific character; its small size in the South Australian example accords with the description of *M. dofleini*. This specimen, the only one recorded from Australian waters, was caught at Goolwa within the River Murray mouth, in a seven-inch gill-net.

#### FAMILY ISURIDAE.

**ISURUS** Rafinesque, 1810 (*oxyrhynchus*).

**ISURUS GLAUCUS** Müller & Henle (Blue Pointer).

*Oxyrhina glauca* Müll. & Henle, Plagios., 1838, p. 69, pl. xxix.

*Lamna spallanzanii* Day, Fish. India, 1878, p. 722, pl. clxxxvi, fig. 2.

*Isurus glaucus* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 38 (ref.).

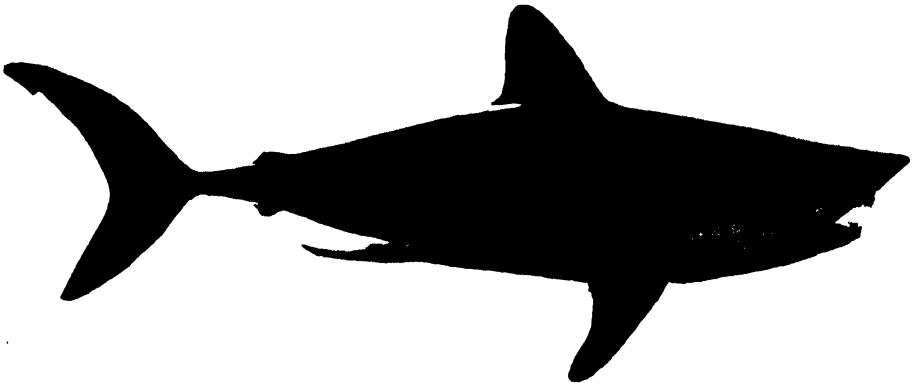


Fig. 27. *Isurus glaucus*.

Not to be confounded with the Blue Shark, which has small gill-slits and a very unequally-lobed tail.

**CARCHARODON** Müller & Henle, 1838 (*rondeletii* = *carcharias*).

**CARCHARODON CARCHARIAS** Linnaeus (White Pointer).

*Squalus carcharias* Linn., Syst. Nat. (ed. x), 1758, p. 235.

*Carcharodon rondeletii* Müll. & Henle, Mag. Nat. Hist. (2), ii, 1838, p. 37 and Plagiost., 1838, p. 70; McCoy, Prod. Zool. Viet., dec. viii, 1883, pl. lxxiv.  
*Carcharodon carcharias* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 32, pl. v, fig. 5-9 (syn.).

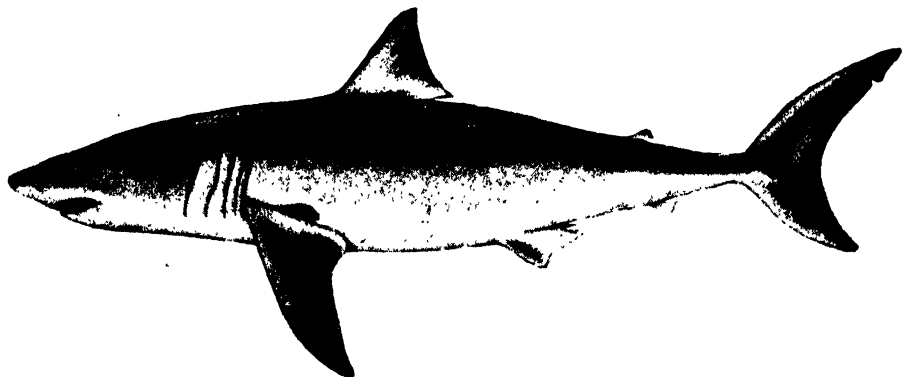


Fig. 28. *Carcharodon carcharias*.

The great Man-eating Shark; found in all warm seas, its distribution girdling the globe. It attains to between thirty-five and forty feet in length. Teeth of but recently extinct allies, dredged from the mid-Pacific, indicate that these huge sharks were quite ninety feet in length, or as long as the largest living whales.

#### FAMILY CETORHINIDAE.

**CETORHINUS** Blainville, 1816 (*gunneri* = *maximus*).

**CETORHINUS MAXIMUS** Gunner (Basking Shark).

*Squalus maximus* Gunn., Trondhj. Selsk. Skrift., iii, 1765, p. 33, pl. ii.

*Selache maxima* Cuv., Règ. Anim., ii, 1817, p. 129; Day, Fish. Gt. Brit. and Irel., ii, 1884, p. 303, pl. clviii, fig. 1.

*Cetorhinus maximus* Gerv., C.R. Acad. Sci. Paris, lxxxii, 1876, pl. cxxxviii; McCoy, Prod. Zool. Viet., dec. xi, 1885, pl. civ; Jord. & Ever., Bull. 47, U.S. Nat. Mus., i, 1896, p. 51 and iv, 1900, pl. vii, fig. 23; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 39 (syn.).



Fig. 29. *Cetorhinus maximus*.

The cast specimen in the S.A. Museum, of which the illustration is a photograph, is over twenty-five feet in length; the species is said to attain to nearly forty feet. The gill-slits extend from the top of the head to the throat, and the gill-rakers act as do the blades of baleen in the whalebone whales, straining from the water the small animals upon which they similarly feed.

### FAMILY SQUALIDAE.

**SQUALUS** Linnaeus, 1758 (*acanthias*).

**SQUALUS FERNANDINUS** Molina (*Spiny Dogfish*).

*Squalus fernandinus* Moll., Saggio sulla storia Nat. Chili, 1782, p. 229; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 195 (syn.).

*Acanthias blainvillii* and *A. megalops* MacL., P.L.S., N.S.W., vi, 1881, p. 367.

*Squalus megalops* Waite, Rec. Aust. Mus., iv, 1901, p. 33, pl. iv, fig. 2 (foetus).

*Acanthias vulgaris* McCoy, Prod. Zool. Viet., dec. viii, 1883, pl. lxxv (not Risso).

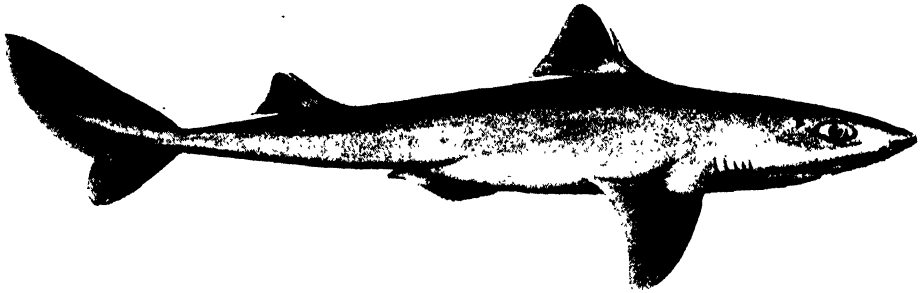


Fig. 30. *Squalus fernandinus*.

The young are born alive, and to provide against laceration of the membranes of the mother by the sharp spines in front of the dorsal fins, each is, before birth, covered with a little knob.

The sharks of the Squalidae and following Families have no anal fin.

**ACANTHIDIUM** Lowe, 1839 (*pusillum*).

**ACANTHIDIUM QUADRISPINOSUM** McCulloch (*Long-snouted Dogfish*).

*Acanthidium quadrispinosum* McCull., Endeavour Res., iii, 1915, p. 100, pl. xiv, fig. 5-8.



Fig. 31. *Acanthidium quadrispinosum*.

Found in deep water in the Great Australian Bight and off Victoria.



**OXYNOTUS Rafinesque, 1910** (*centrina*).**OXYNOTUS BRUNIENSIS Ogilby** (Rough Shark).

*Centrina salviana* Hutt., T.N.Z. Inst., xxii, 1890, p. 276 (not Risso).

*Centrina bruniensis* Ogil., Rec. Aust. Mus., ii, 1893, p. 62.

*Oxynotus bruniensis* Waite, Rec. Cant. Mus., i, 1907, p. 8; McCull., Endeavour Res., ii, 1914, p. 80, pl. xiii.

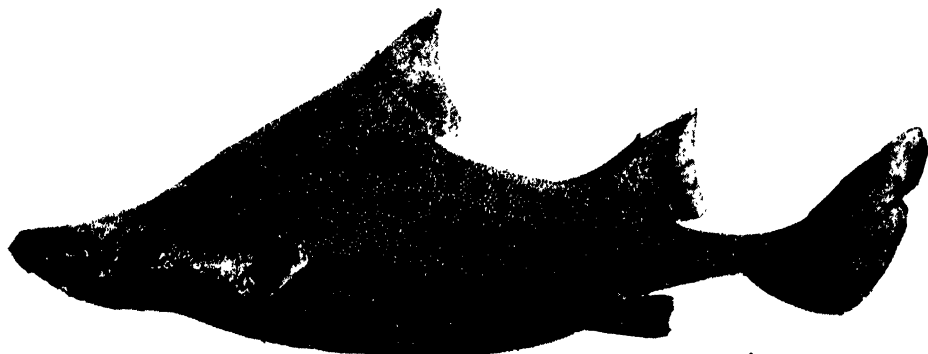


Fig. 32. *Oxynotus bruniensis*.

A small ground shark with high triangular body and rough scales, each having five cusps.

## FAMILY SCYMNORHINIDAE.

**SCYMNORHINUS Bonaparte, 1846** (*lichia* = *lichia*).**SCYMNORHINUS LICHA Bonnaterrre.**

*Squalus licha* Bonn., Encycl. Meth., Ichth., 1788, p. 12.

*Dalatias lichia* Gray, Chondropt., 1851, p. 75.

*Scymnorhinus licha* Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 236 (syn.); McCull., Endeavour Res., ii, 1914, p. 81, pl. xiv, fig. 1 and text fig. 1.

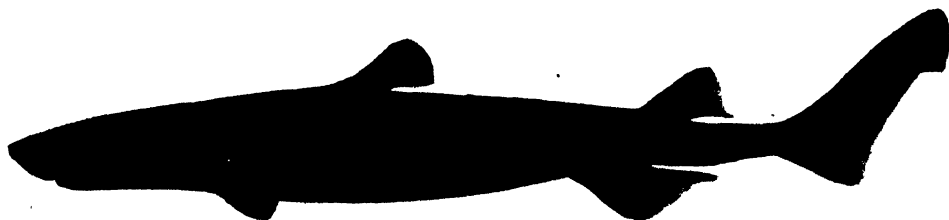


Fig. 33. *Scymnorhinus licha*.

This and the foregoing species (*Oxynotus bruniensis*) occur in the Great Australian Bight, also in New Zealand waters.

## FAMILY PRISTIOPHORIDAE.

**PRISTIOPHORUS** Müller & Henle, 1837 (*cirratus*).**PRISTIOPHORUS CIRRATUS** Latham (Saw Shark).

*Pristis cirratus* Lath., T.L.S., ii, 1794, p. 281, pl. xxvi, fig. 5 (saw) and xxvii.  
*Pristiophorus cirratus* Müll. & Henle, Arch. f. Naturg., iii, 1837, and Plagiost., 1838, p. 98.

The little saw sharks, of which we have two species, are not to be confounded with the sawfishes (*Pristis*), the latter being rays, not sharks, and not, so far, recorded from South Australia.

**PRISTIOPHORUS NUDIPINNIS** Günther (Saw Shark).

*Pristiophorus nudipinnis* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 432; McCoy, Prod. Zool. Vict., dec. vi, 1881, pl. lvi, fig. 2; McCull., Endeavour Res., i, 1911, p. 10, pl. i, fig. 2.



Fig. 35. *Pristiophorus nudipinnis*.

The teeth in the saw are not developed at the expense of the true teeth, which arm the mouth. The young are born alive, and until birth the saw teeth are folded against the blade and so prevent injury to the parent.

## FAMILY SQUATINIDAE.

**SQUATINA** Duméril, 1806 (*squatina*).**SQUATINA AUSTRALIS** Regan (Angel Shark).

*Rhina squatina* McCoy, Prod. Zool. Vict., dec. iv, 1879, pl. xxxiv (not Linn.).  
*Squatina squatina* Waite, Mem. Aust. Mus., iv, 1899, p. 37.  
*Squatina australis* Regan, Ann. Mag. Nat. Hist. (ser. 7), xviii, 1906, p. 438.

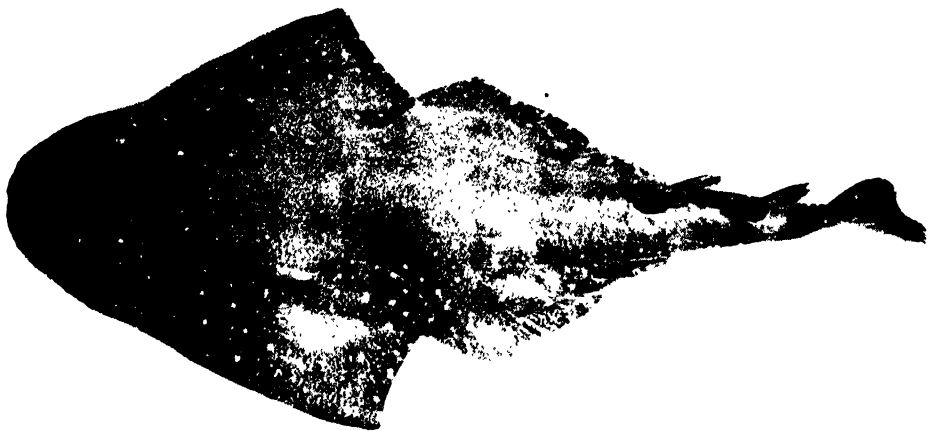


Fig. 36. *Squatina australis*.

Though classed with the sharks, the general features ally it rather with the rays; the broad flattened body, the small dorsal fins and their backward position, the slender tail and character of the vertebrae, are all ray-like; the lateral position of the gill-slits indicates affinities with the sharks. It is, in fact, a transitional form.

**SQUATINA TERGOCELLATA McCulloch** (Large-spotted Angel Shark).

*Squatina tergozellata* McCull., Endeavour Res., ii, 1914, p. 84, pl. xv, and text fig. 2.

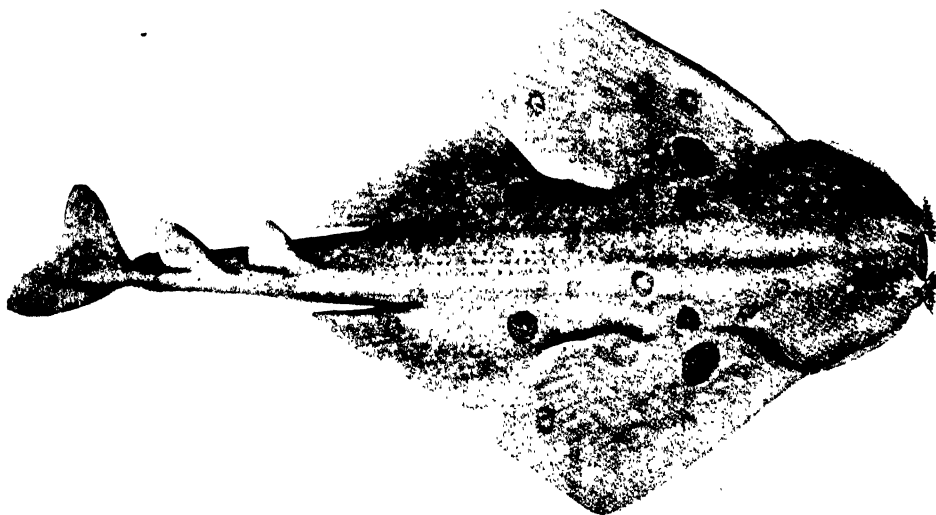


Fig. 37. *Squatina tergozellata*.

Known from a single specimen, taken in the Great Australian Bight.

**ORDER BATOIDEI (RAYS).**

**FAMILY RHINOBATIDAE.**

**RHINOBATUS** Bloch & Schneider, 1801 (*rhinobatus*).

**RHINOBATUS PHILIPPI** Müller & Henle (*Shovel-nosed Ray*).

*Rhinobatus philippi* Müll. & Henle, Plagiost., 1838, p. 119, pl. xxxix; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 278.

*Rhinobatus banksii* Müll. & Henle, Plagiost., 1838, p. 123, 192; Waite, Mem. Aust. Mus., iv, 1899, p. 38, pl. iii.

*Rhinobates vincentianus* Haacke, Zool. Anz., viii, 1885, p. 508.

*Rhinobatus bougainvillei* Ogil., P.L.S., N.S.W., x, 1886, p. 464.

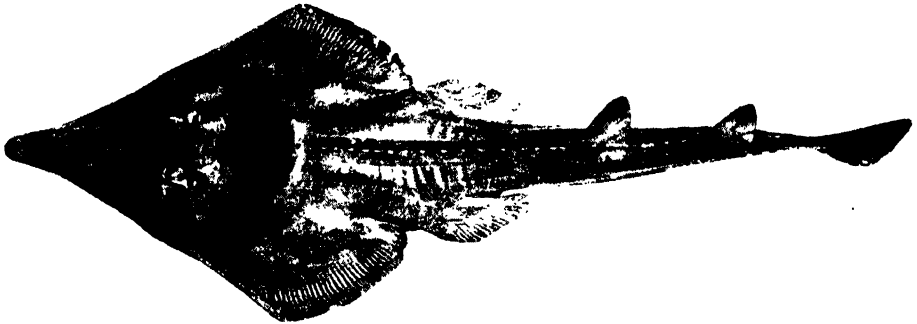


Fig. 38. *Rhinobatus philippi*.

Unlike the skates, the rays of this Family hatch the eggs within the body; the young are thus born alive and active.

**TRIGONORRHINA** Müller & Henle, 1838 (*fasciata*).

**TRIGONORRHINA FASCIATA** Müller & Henle (*Fiddler*).

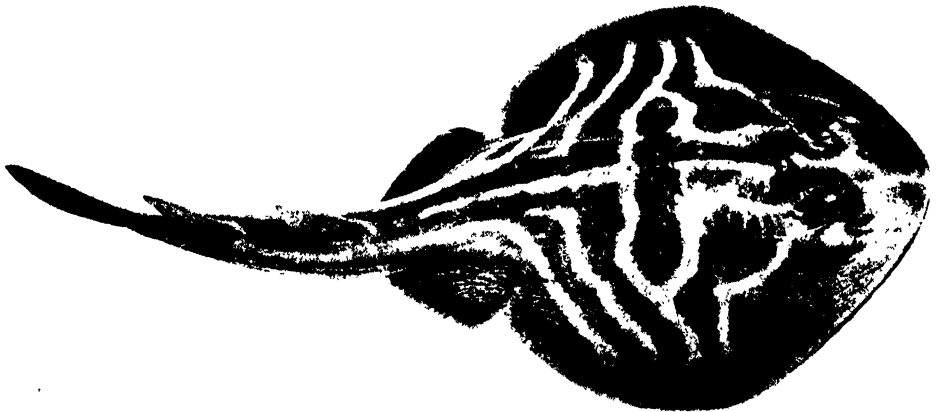


Fig. 39. *Trigonorrhina fasciata*.

*Trigonorrhina fasciata* Müll. & Henle, Mag. Nat. Hist. (2), ii, 1837, p. 90 and Plagiost., 1838, p. 124, pl. xliii.

Extremely common; a frequenter of shallow water, where it cruises around the jetties in search of food which is harboured by the piles.

## FAMILY NARCOBATIDAE.

**NARCOBATUS** Blainville, 1816 (torpedo).

**NARCOBATUS FAIRCHILD** Hutton (Southern Numbfish).

*Torpedo fairchildi* Hutt., Cat. Fish. N.Z., 1872, p. 83, pl. xii, fig. 134; McCull., Rec. Aust. Mus., xii, 1919, p. 171, pl. xxv.

*Torpedo fusca* Parker, T.N.Z. Inst., xvi, 1884, p. 283, pl. xxii.

*Narcacion fairchildi* Waite, Rec. Cant. Mus., i, 1909, p. 144, pl. xvii.

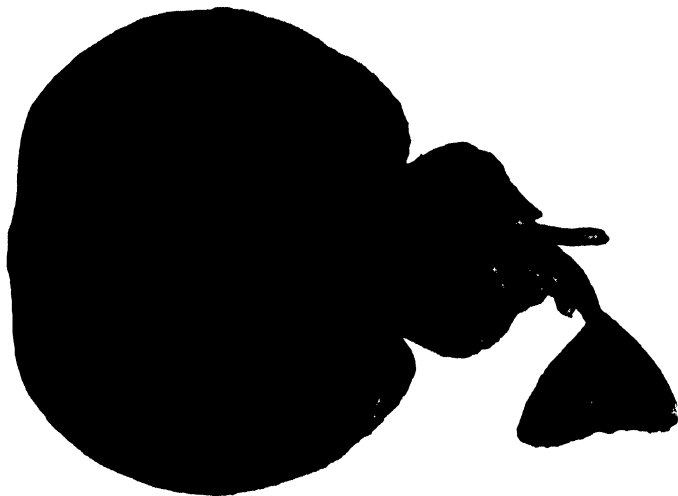


Fig. 40. *Narcobatus fairchildi*.

Frequents deeper water than the foregoing, and its range extends to the south of New Zealand.

**HYPNARCE** Waite, 1902 (subnigra).

**HYPNARCE SUBNIGRA** Duméril (Numbfish).

*Hypnos subnigrum* Dum., Rev. Mag. Zool. (2), iv, 1852, p. 279, pl. xii.

*Hypnarce subnigra* Waite, Rec. Aust. Mus., iv, 1902, p. 180.

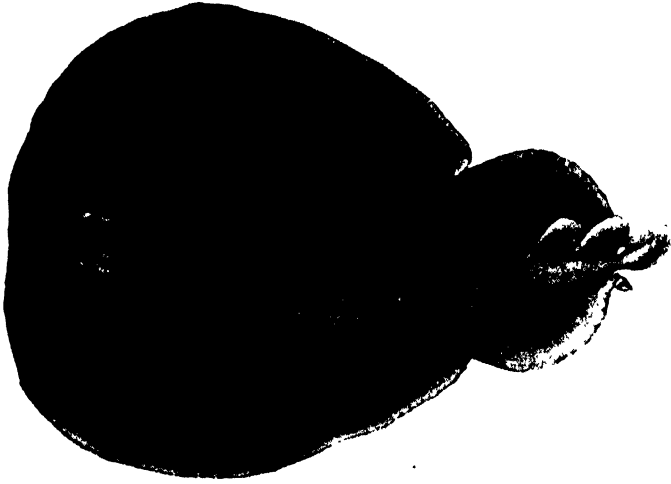


Fig. 41. *Hypnaree subnigra*.

The larger forms of the family of electric rays are capable of giving very powerful shocks. This species attains to over two feet in length and, in our waters, is subject to peculiar distortion, which greatly changes its appearance.

#### FAMILY RAJIDAE.

**RAJA** Linnaeus, 1758 (batis).

**RAJA LEMPRIERI** Richardson (Skate).

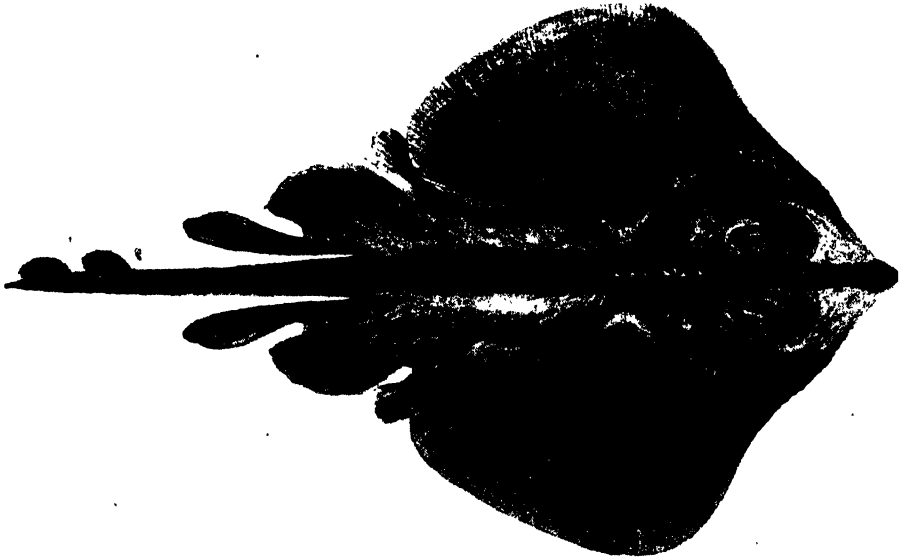


Fig. 42. *Raja lemprieri*.

*Raia lemprieri* Rich., Zool. Ereb. & Terr., 1845, p. 34, pl. xxiii.

*Raja dentata* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 46.

*Raja australis* Mael, P.L.S., N.S.W., viii 1884, p. 461; Waite, Mem. Aust. Mus., iv, 1899, p. 40, pl. iv.

In other countries skates are used as food. The eggs are laid in four-cornered cases, the familiar "Skate-barrows."

**PSAMMOBATIS** Günther, 1870 (*rudis*).

**PSAMMOBATIS WAITII** McCulloch (Round Ray).

*Raja waitii* McCull., Endeavour Res., i., 1911, p. 12, pl. iii, and text fig. 4.

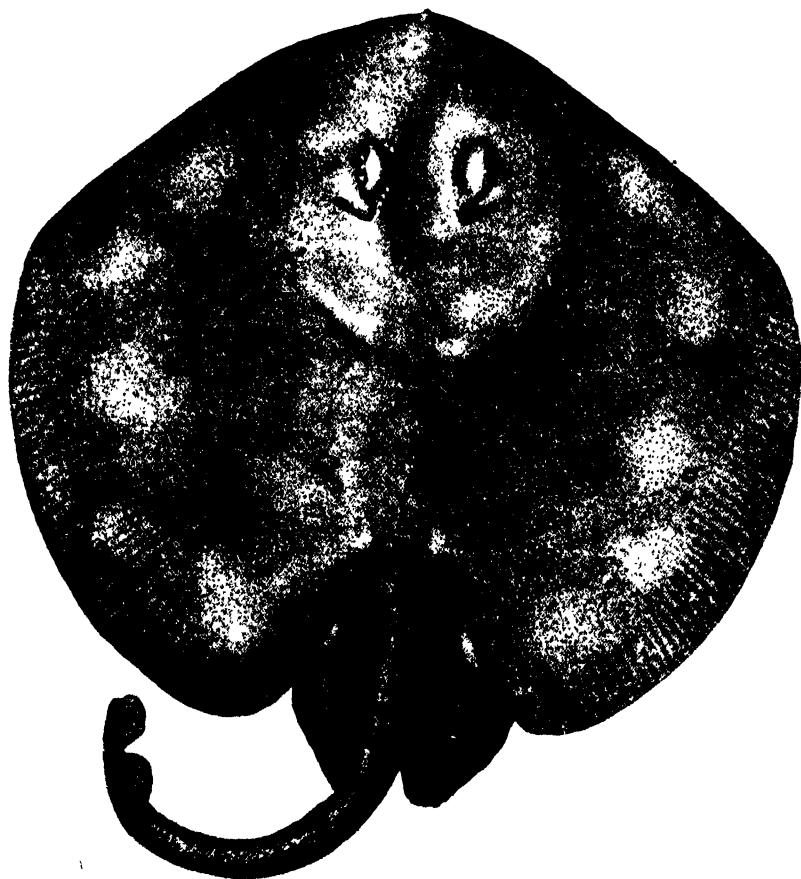


Fig. 43. *Psammobatis waitii*.

Remarkable for its almost circular shape and smooth skin. It is known only from a single specimen, taken off Greenly Island, South Australia.

FAMILY DASYATIDAE.

**DASYATIS Rafinesque, 1810** (*pastinacus*).

**DASYATIS BREVICAUDATUS Hutton** (*Stingray*).

*Trygon brevicaudata* Hutt., Ann. Mag. Nat. Hist. (4), xvi, 1875, p. 317.

*Dasybatus brevicaudatus* Waite, Rec. Cant. Mus., i, 1909, p. 151, pl. xxii.

*Dasyatis brevicaudatus* McCull., Endeavour Res., iii., 1915, p. 102, pl. xv, fig. 1 and xvii, fig. 1.

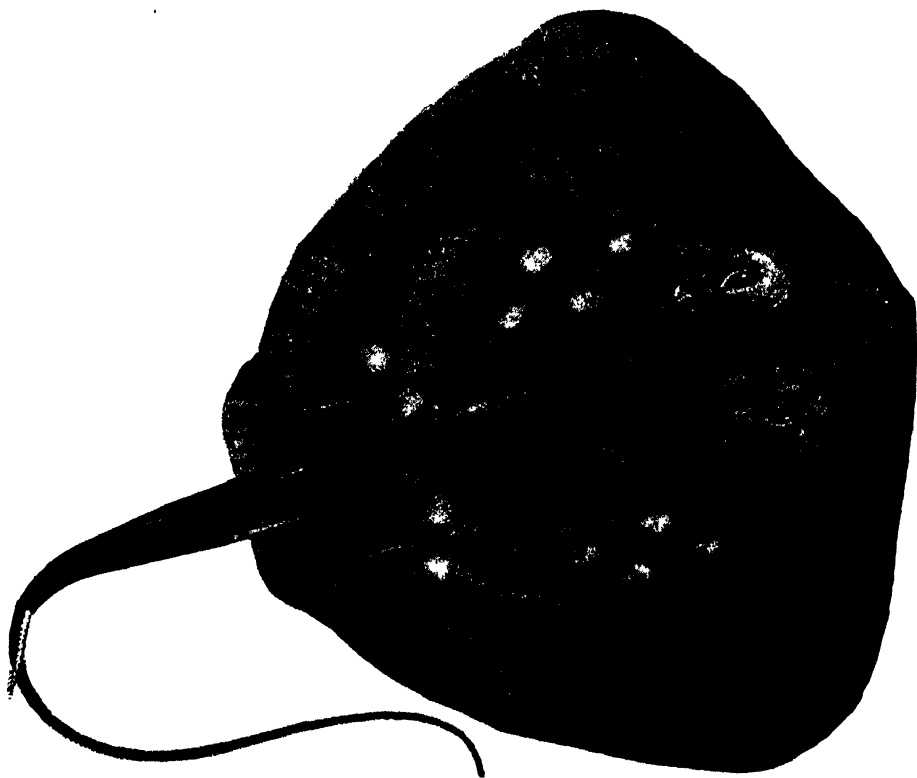


Fig. 44. *Dasyatis brevicaudatus*.

This species was described from a mutilated example, hence the unfortunate name (*brevicaudatus*). The large dark object seen gliding along the bottom in the deeper water off Kangaroo Island is doubtless this Stingray.



**UROLOPHUS Müller & Henle, 1837 (cruciatus).****UROLOPHUS CRUCIATUS Lacepède (Banded Stingaree).**

*Raja cruciata* Lacep., Ann. Mus. Hist. Nat., iv, 1804, p. 201, 210, pl. lv, fig. 2.

*Leiobatus cruciatus* Blainv., Bull. Soc. Philom., 1816, p. 121.

*Urolophus ephippiatus* Rich., Zool. Ereb. & Terr., 1845, p. 35, pl. xxiv.

*Urolophus cruciatus*, Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 485; McCull., Endeavour Res., iv, 1916, p. 171.

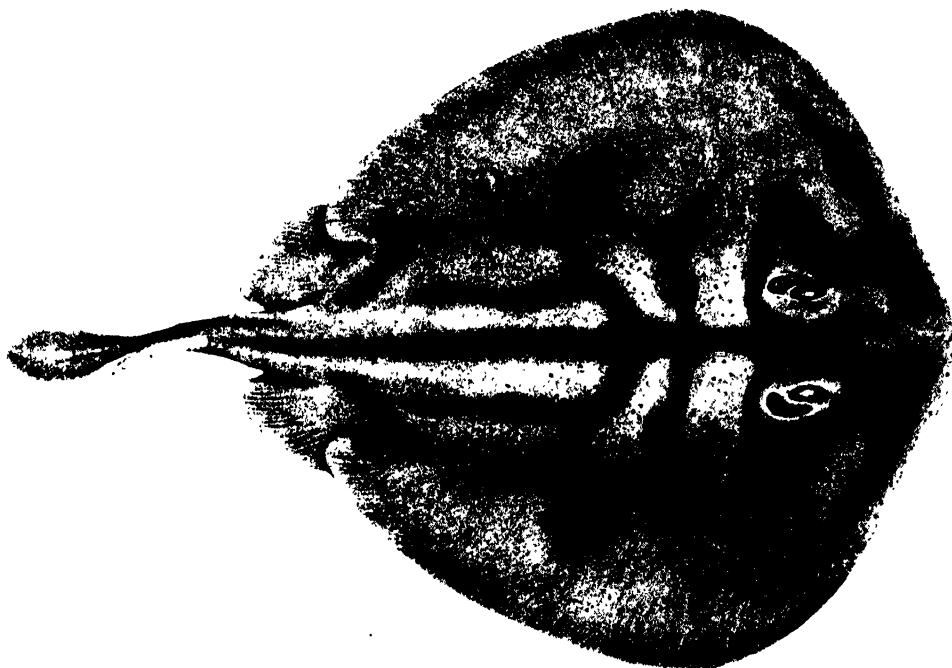


Fig. 45. *Urolophus cruciatus*.

Stingaree is the name assigned to the smaller forms, in which the tail is of moderate length and provided with an expanded fin. The larger rays, with a long whip-like tail, are called Stingrays, though the nomenclature is not observed throughout Australia. The Banded Stingaree is a deep-water form, hence the species generally taken by trawling.

**UROLOPHUS TESTACEUS Müller & Henle (Stingaree).**

*Trygonoptera testacea* Müll. & Henle, Plagiost., 1838, p. 174, pl. lvii.

*Urolophus testaceus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 486; McCull., Endeavour Res., iv, 1916, p. 174, pl. 1.

*Trygon testacea* Zietz, T.R.S., S.A., xxxii, 1908, p. 292.

*Trygonoptera mullerii*, *T. henlei* and *T. australis*, Steind., Sitzb. Akad. Wiss. Wien, lxxx, 1866, p. 479, 480, pl. vi, fig. 4, 5 and pl. vii.

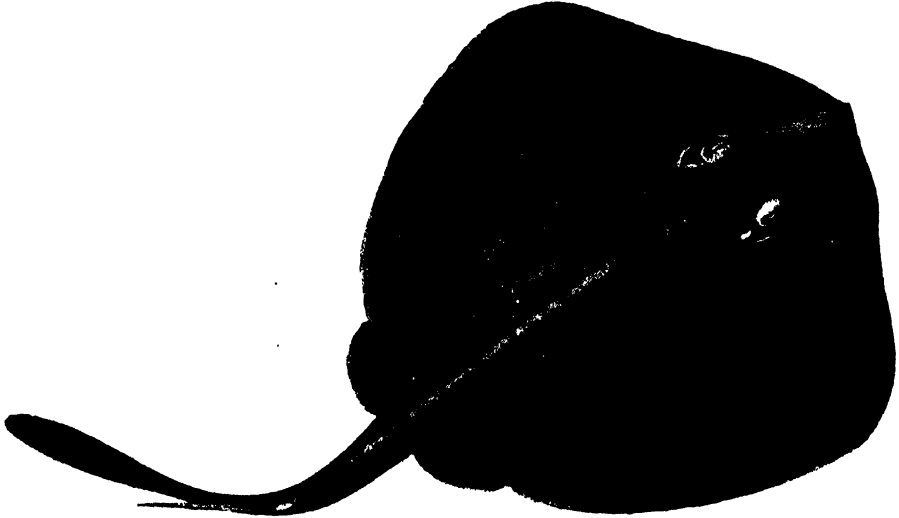


Fig. 46. *Urolophus testaceus*.

Common in shallow water. There is no poison sac in connection with the tail-spines of the Stingarees, but the spines make jagged and painful wounds.

**UROLOPHUS EXPANSUS McCulloch** (Broad-backed Stingaree).

*Urolophus expansus* McCull., Endeavour Res., iv, 1916, p. 178, fig. 2.

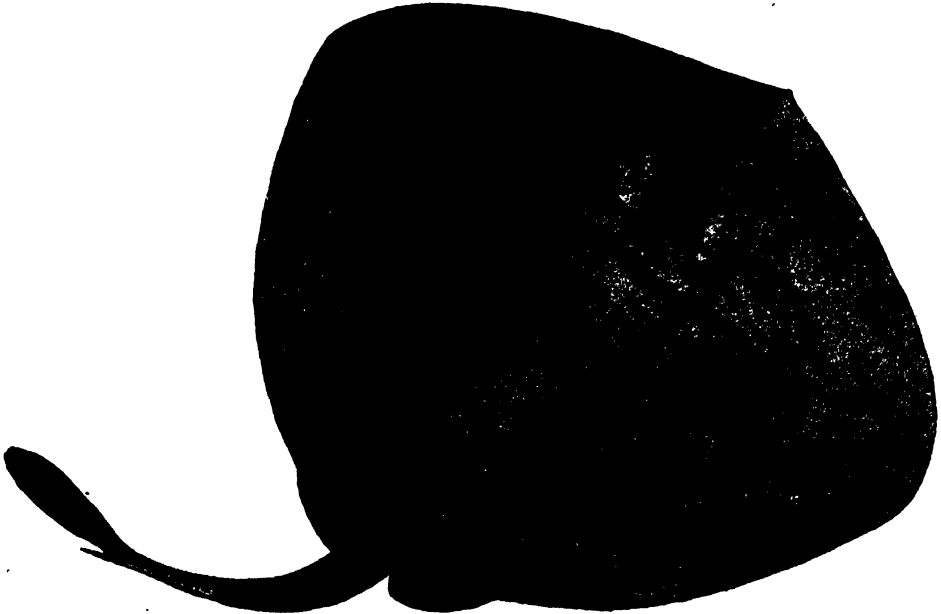


Fig. 47. *Urolophus expansus*.

Taken in the Great Australian Bight, 80-120 fathoms.

FAMILY MYLIOBATIDAE.

**MYLIOBATIS** Cuvier, 1817 (aquila).

**MYLIOBATIS TENUICAUDATUS** Hector (Eagle Ray).

*Myliobatis tenuicaudatus* Hect., T.N.Z. Inst., ix, 1877, p. 468; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 433.

*Myliobatis australis* Mael., P.L.S., N.S.W., vi, 1881, p. 380; McCoy, Prod. Zool. Viet., dec. vii, 1882, pl. lxiii.

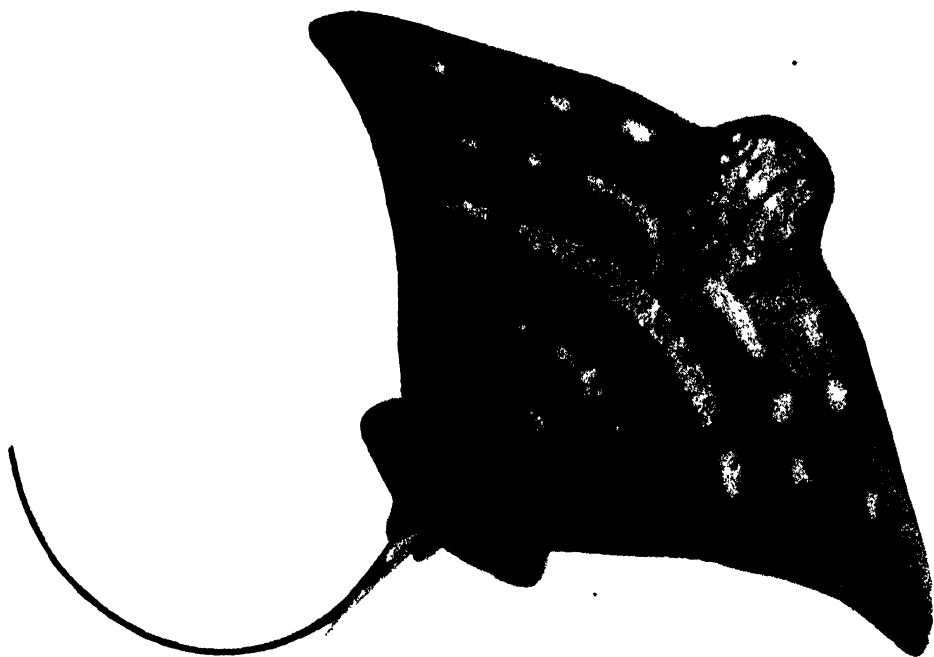


Fig. 48. *Myliobatis tenuicaudatus*.

Crushes shells with its flat pavement-like teeth, whence it is also called Mill Ray.

## SUB-CLASS HOLOCEPHALI.

## FAMILY CALLORHYNCHIDAE.

**CALLORHYNCHUS** Cuvier, 1817 (*callorhynchus*).**CALLORHYNCHUS MILII** Bory (Elephant Shark).

*Callorhynchus milii* Bory, Diet. Class. Hist. Nat., iii, 1823, p. 62, pl. v; Garm., Bull. Mus. Comp. Zool., xli, 1904, p. 266, pl. vi, fig. 7-8 (teeth) and xv, fig. 4, 5 (brain).

*Callorhynchus antarcticus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 351 (part); McCoy, Prod. Zool. Viet., dec. xii, 1886, pl. cxii.

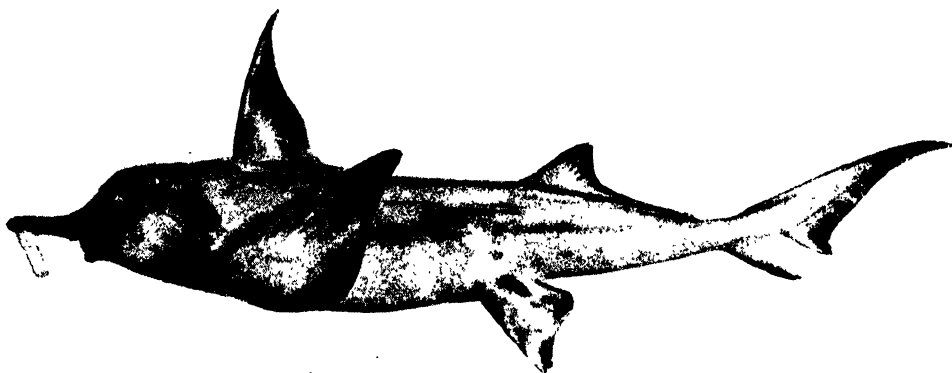


Fig. 49. *Callorhynchus milii*.

The quaint forms of the Sub-class *Holocephali* have a single external gill-slit and a depressible dorsal spine. In the Port Jackson Sharks and the Spiny Dogfishes, the spines are fixed in erect position and precede both dorsal fins.

## SUB-CLASS TELEOSTOMI (BONY FISHES).

## ORDER ISOSPONDYLI.

## FAMILY ENGRAULIDAE.

**ENGRAULIS** Cuvier, 1817 (*encrasicholus*).**ENGRAULIS AUSTRALIS** Shaw (Anchovy).

*Atherina australis* Shaw, in White's Voy. N.S.W., 1790, p. 296, pl. lxiv, fig. 1.

*Engraulis australis* McCoy, Off. Rec. Interc. Exhib. Melb., 1866, p. 319; McCull., Rec. Aust. Mus., xiii, 1920, p. 43, pl. xii, fig. 1 (ref.).

*Engraulis antipodum* Günth., Cat. Fish. Brit. Mus., vii, 1868, p. 386.

*Engraulis antarcticus* Cast., P.Z.S. Viet., i, 1872, p. 186.

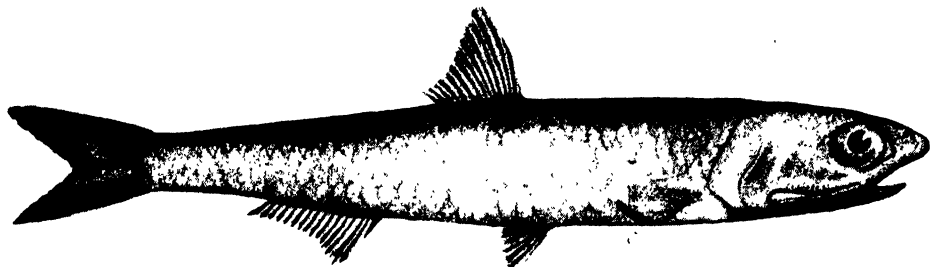


Fig. 50. *Engraulis australis*.

Occasionally reported as occurring in immense shoals off Eastern and Victorian coasts. Has been similarly recorded here, but systematic observations are needed, only possible when a fisheries bureau is instituted on a scientific basis. Anchovies are valuable economic fishes.

#### FAMILY CLUPEIDAE.

**ETRUMEUS** Bleeker, 1853 (micropus).

**ETRUMEUS JACKSONIENSIS** Macleay (Maray).

*Etrumeus jacksoniensis* MacL., P.L.S., N.S.W., iii, 1878, p. 36, pl. iv, fig. 1 and iv, 1879, p. 382; Ogil., Edib. Fish. N.S.W., 1893, p. 186; McCull., Rec. W.A. Mus., i, 1914, p. 211, pl. xxix.

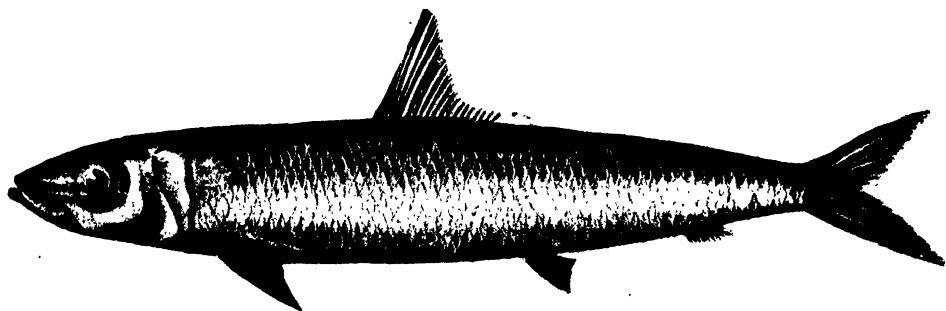


Fig. 51. *Etrumeus jacksoniensis*.

Like the Pilehard, occurs in great shoals: it is somewhat similar to that fish but can be at once distinguished by the round smooth belly, from which character the name "Round Herrings" is applied to members of this genus.

**CLUPEA** Linnaeus, 1758 (harengus).

**CLUPEA BASSENSIS** McCulloch (Sprat).

*Clupea sprattus* Günth., P.Z.S., 1871, p. 672 (not Linn.).

*Clupea bassensis* McCull., Endeavour Res., i, 1911, p. 16, pl. iv, fig. 2.

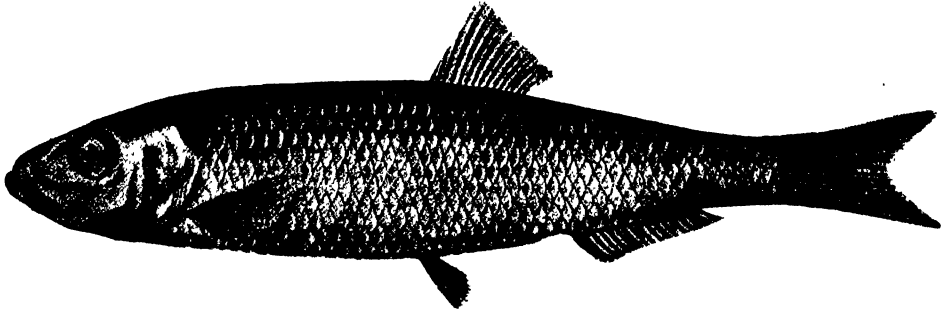


Fig. 52. *Clupea bassensis*.

Scarcely distinguishable from the European Sprat, but not commercially netted.

**SARDINIA** Poey, 1860 (pseudohispanica).

**SARDINIA NEOPILCHARDA** Steindachner (Pilchard).

*Clupea neopilchardus* Steind., Denk. Akad. Wien., xli, 1879, p. 12.

*Clupea sagar* Cast., P.Z.S., Viet., i, 1872, p. 187; Ogil., Edib. Fish. N.S.W., 1893, p. 180, pl. xlv.

*Clupanodon neopilchardus* Waite, Mem. Aust. Mus., iv, 1899, p. 53; Stead, Edib. Fish. N.S.W., 1908, p. 25, pl. iv; McCull., Endeavour Res., i, 1911, p. 17; Roughley, Fish. Aust., 1916, p. 30.

*Amblygaster neopilchardus* Waite, Aust. Antaret. Exped. Fishes, iii, 1916, p. 56.

*Sardina neopilchardus* Regan, A.M.N.H. (8), xviii, 1916, p. 14, pl. i, fig. 2.

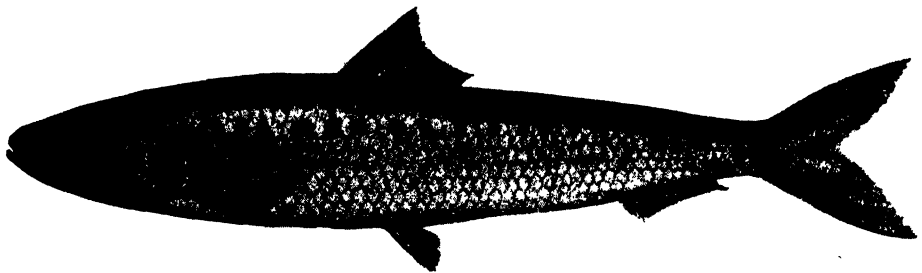


Fig. 53. *Sardinia neopilcharda*.

Said to visit Australian shores every winter in countless myriads, and destined some day to become an important source of food. In Europe young

Pilchards are the familiar Sardines. In America Pilchards of any age are called Sardines. These and allied fishes differ from the "Round Herrings" in having the belly sharp and rough to the touch.

**DOROSOMA Rafinesque, 1820 (heterura).**

**DOROSOMA COME Richardson (Bony Bream, Tukari).**

*Chatoessus come* Rich., Zool. Ereb. & Terr., ii, 1845, p. 62, pl. xxxviii, fig. 7-10.

*Chatoessus erebi* Günth., Cat. Fish. Brit. Mus., vii, 1868, p. 407; Cast., P.Z.S., Viet., i, 1872, p. 184.

*Chatoessus richardsoni* Cast., op. cit., ii, 1873, p. 144; Ogil., Edib. Fish. N.S.W., 1893, p. 178.

*Chatoessus horni* Zietz, Rep. Horn Exped., ii, 1896, p. 180, pl. xvi, fig. 6.

*Dorosoma nasus* Stead, Edib. Fish. N.S.W., 1908, p. 24, pl. iii.

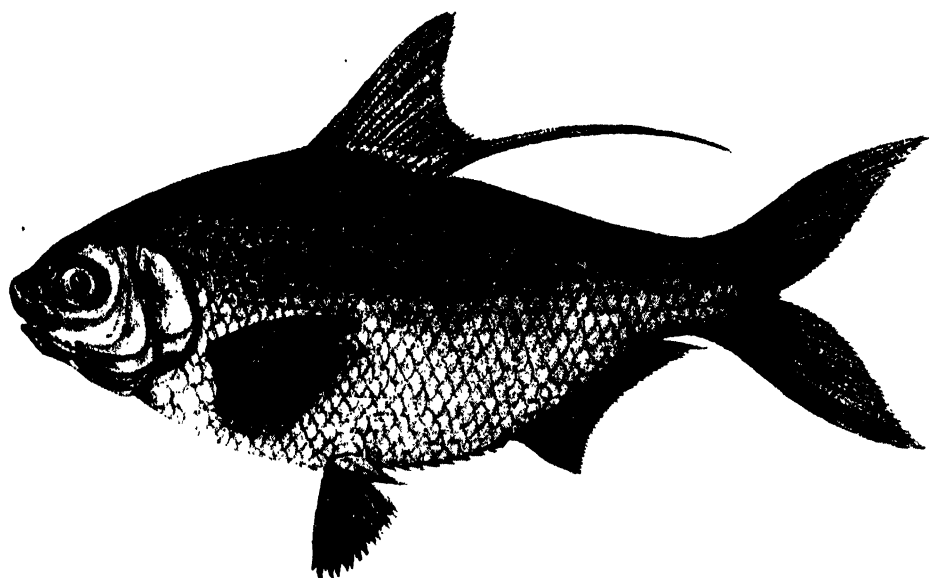


Fig. 54. *Dorosoma come*.

Too bony to be appreciated as food, but the objectionable feature may be largely overcome by souasing the fish in vinegar.

**STOLEPHORUS Lacepède, 1803 (japonicus).**

**STOLEPHORUS ROBUSTUS Ogilby (Blue Sprat).**

*Spratelloides robustus* Ogil., P.L.S., N.S.W., xxii, 1898, p. 64. .

*Stolephorus robustus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 12 and Rec. Aust. Mus., vi, 1906, p. 195; McCull., Rec. Aust. Mus., xiii, 1920, p. 42, pl. xi, fig 1.  
*Spratellodes delicatulus* Zietz, T.R.S., S.A., xxxii, 1908, p. 295 (not Benn.).

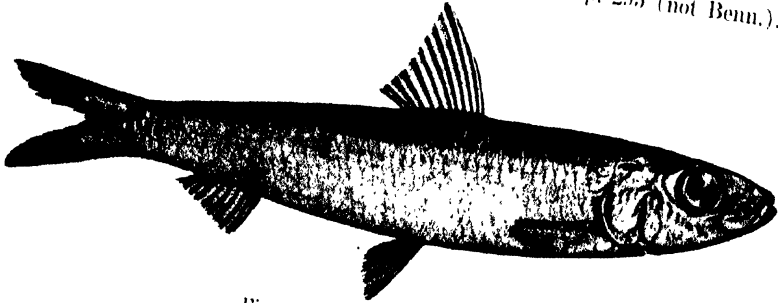


Fig. 55. *Stolephorus robustus*.

An excellent little food fish, but not more than four inches long. Differs from the next species in having the back and belly smooth.

**HYPERLOPHUS** Ogilby, 1893 (spratellides=vittatus).

**HYPERLOPHUS VITTATUS** Castelnau (Rough-backed Sprat).

*Meletta vittata* Cast., Res. Fish. Aust., 1875, p. 46.  
*Clupea vittata* Mael., P.L.S., N.S.W., iv, 1879, p. 379.  
*Clupea spratellides* Ogil., Rec. Aust. Mus., ii, 1892, p. 24.  
*Diplomystus spratellides* Ogil., Edib. Fish. N.S.W., 1893, p. 183.  
*Hyperlophus (Omochetus) copii* Ogil., P.L.S., N.S.W., xxii, 1898, p. 72.  
*Hyperlophus vittatus* McCull., Rec. Aust. Mus., xi, 1917, p. 163, pl. xxix, fig. 1, 2.

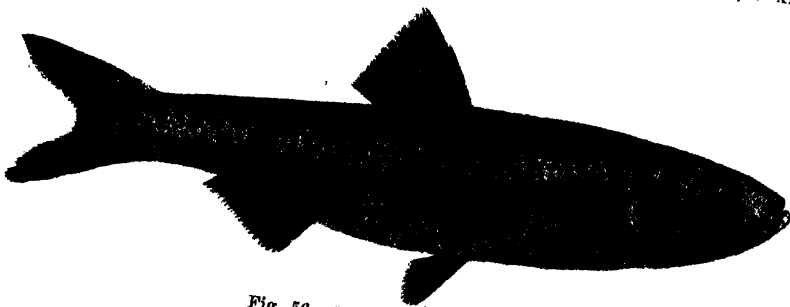


Fig. 56. *Hyperlophus vittatus*.



"A delicate and delicious little fish, destined to become the very finest sardine of commerce." The back and belly are both rough.

### FAMILY GONORHYNCHIDAE.

**GONORHYNCHUS** Scopoli, 1777 (gonorhynchus).

**GONORHYNCHUS GREYI** Richardson (Sand Fish).

*Rynchana greyi* Rich., Zool. Ereb. & Terr., 1845, p. 44, pl. xxix, fig. 1-6 and text fig.

*Gonorhynchus greyi* Günth., Cat. Fish. Brit. Mus., vii, 1868, p. 373.

*Gonorhynchus gonorynchus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 13; Stead, "Beaked Salmon," 1908, plate and text fig. (scale).

*Gonorrhynchus forsteri* Ogil., Ann. Qld. Mus., x, 1911, p. 34.

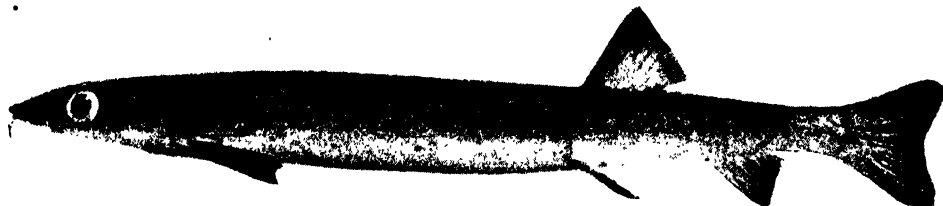


Fig. 57. *Gonorhynchus greyi*.

A somewhat primitive marine fish, living on sandy stretches, but seldom seen; its body is almost circular in section; its flesh white, firm and good to eat. The undershot jaw is responsible for the name "Sand Shark"; it is also known as "Beaked Salmon."

### FAMILY GALAXIIDAE.

**GALAXIAS** Cuvier, 1817 (truttaceus).

**GALAXIAS ATTENUATUS** Jenyns (Native trout, Pulangi).

*Galaxias truttaceus* Valenc., in Cuv., Ill. Règ. Anim., 1829, pl. xevii, fig. 1 (not Cuv.).

*Mesites attenuatus* Jenyns, Zool. Beagle, iii, 1842, p. 121, pl. xxii, fig. 5.

*Galaxias scribe* and *G. attenuatus* Cuv. & Val., Hist. Nat. Poiss., xviii, 1846, p. 347, 348.

*Galaxias maculatus* Rich., Zool. Ereb. & Terr., 1848, p. 75, pl. xliii, fig. 14-17 (not Jenyns).

*Galaxias minutus* Philippi, Arch. f. Naturg., xxiv, 1858, p. 309.

*Galaxias krefftii* and *G. punctatus* Günth., Cat. Fish. Brit. Mus., vi, 1866, p. 211, 212.

*Galaxias waterhousei* Krefft, P.Z.S., 1867, p. 943.

*Galaxias cylindricus* and *G. delicatulus* Cast., P.Z.S., Viet., i, 1872, p. 177, 178.

*Galaxias campbelli* Sauv., Bull. Soc. Phil. (7), iv, 1880, p. 229.

*Galaxias nebulosa* Mael., P.L.S., N.S.W., vi, 1881, p. 234.

*Austrocobitis attenuatus* Ogil., P.L.S., N.S.W., xxiv, 1899, p. 158.

*Galaxias alpinus* (part) Smitt, Bih. Svenska Akad., xxvi (iv, 13), 1901, p. 21, pl. ii, fig. 9-12.

*Galaxias attenuatus* Regan, P.Z.S., 1906, p. 368, pl. xii, fig. 1 and xiii, fig. 2.



Fig. 58. *Galaxias attenuatus*.

Common in all our fresh-waters that run to the sea, where the species is believed to spawn. Has a very wide distribution in Southern seas, which circumstance is frequently advanced in support of the contention of a former Antarctic Continent. The young of this species, caught ascending the rivers, is the main constituent of the New Zealand "whitebait."

### **GALAXIAS OLIDUS** Günther (Minnow).

*Galaxias olidus* Günth., Cat. Fish. Brit. Mus., vi, 1866, p. 209; Regan, P.Z.S., 1906, p. 381, pl. xi, fig. 3.

*Galaxias schomburgkii* Peters, Mon. Akad. Berl., 1868, p. 455; Regan, *op. cit.*, p. 382.

*Galaxias kayi* Rams. & Ogil., P.L.S., N.S.W. (2), i, 1887, p. 6.



Fig. 59. *Galaxias olidus*.

Similar to the preceding but confined to fresh-water; is appreciated as a pau fish by picnickers. An excellent aquarium fish, but has, so far, not been bred in captivity.

**GALAXIAS COXII Macleay** (Mountain Trout).

*Galaxias coxii* Mael., P.L.S., N.S.W., v, 1880, p. 45; Ogil., Edib. Fish. N.S.W., 1893, p. 176; Regan, P.Z.S., 1906, p. 380, pl. xii, fig. 2; Zietz, T.R.S., S.A., xxxii, 1908, p. 297.

*Galaxias n'gothoruk* Lucas, P.R.S., Viet. (2), iv, 1892, p. 27.



Fig. 60. *Galaxias coxii*.

The occurrence of this species in South Australia is doubtful.

## FAMILY ARGENTINIDAE.

**ARGENTINA Linnaeus**, 1758 (sphyraena).

**ARGENTINA ELONGATA Hutton** (Silverside).

*Argentina elongata* Hutt., A.M.N.H. (5), iii, 1879, p. 53; Günth., Chall. Rep., xxii, 1887, p. 218, pl. lv, fig. B; McCull., Endeavour Res., i, 1911, p. 18 and ii, 1914, p. 87; Waite, Rec. Cant. Mus., i, 1911, p. 161, pl. xxiv.

*Argentina decagon* Clarke, T.N.Z.L., xi, 1879, p. 296, pl. xiv.

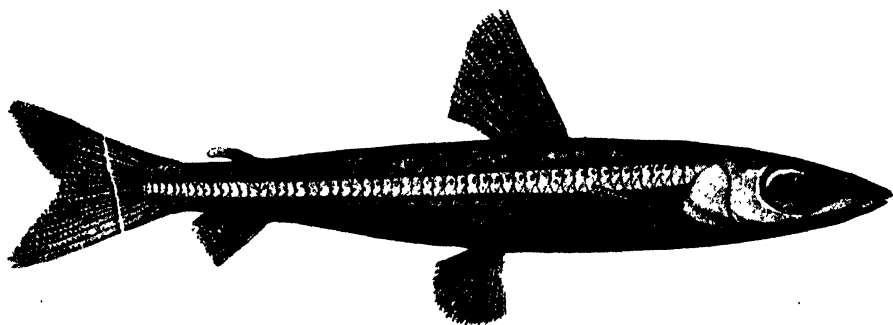


Fig. 61. *Argentina elongata*.

A deep-water fish, taken by the "Endeavour" in the Great Australian Bight.

## FAMILY RETROPINNIDAE.

**RETROPINNA Gill, 1862 (retropinna).****RETROPINNA SEMONI Weber (Smelt, Kantari).**

*Richardsonia retropinna* Steind., Sitz. Akad. Wiss. Wien, lili, 1866, p. 469 (not Rich.).

*Retropinna richardsonii* MacL., P.L.S., N.S.W., vi, 1882, p. 228 (not Gill).

*Retropinna retropinna* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 13 (not Rich.).

*Prototroctes semoni* Weber, Zool. Forsch. Aust., v, 1895, p. 274.

*Jenynsella weathcrilli* Ogil., Ann. Qld. Mus., ix, 1908, p. 15.

*Jenynsella semoni* Ogil., Mem. Qld. Mus., i, 1912, p. 32.

*Retropinna semoni* Ogil., Mem. Qld. Mus., vi, 1918, p. 97; McCull., Rec. Aust. Mus., xiii, 1920, p. 49, pl. xi, fig. 2, 3.

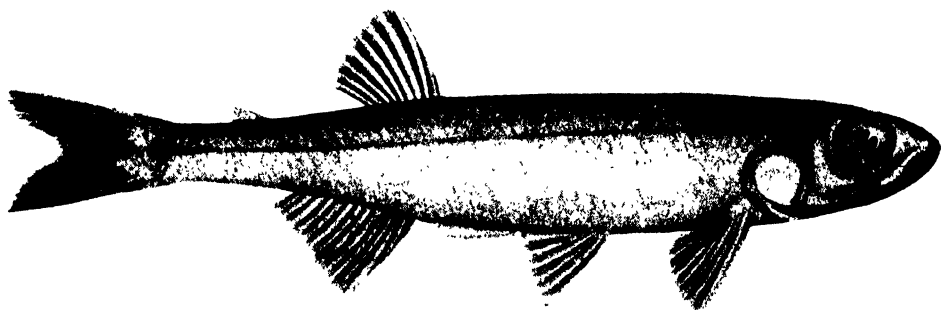


Fig. 62. *Retropinna semoni*.

Like its British prototype (*Osmerus*), this little fish has an odour resembling that of a cucumber.

## FAMILY STERNOPTYCHIDAE.

**POLYIPNUS Günther, 1887 (spinosus).****POLYIPNUS TRIDENTIFER McCulloch (Luminous Fish).**

*Polyipnus tridentifer* McCull., Endeavour Res., ii, 1914, p. 87, pl. xvi and fig. 4.

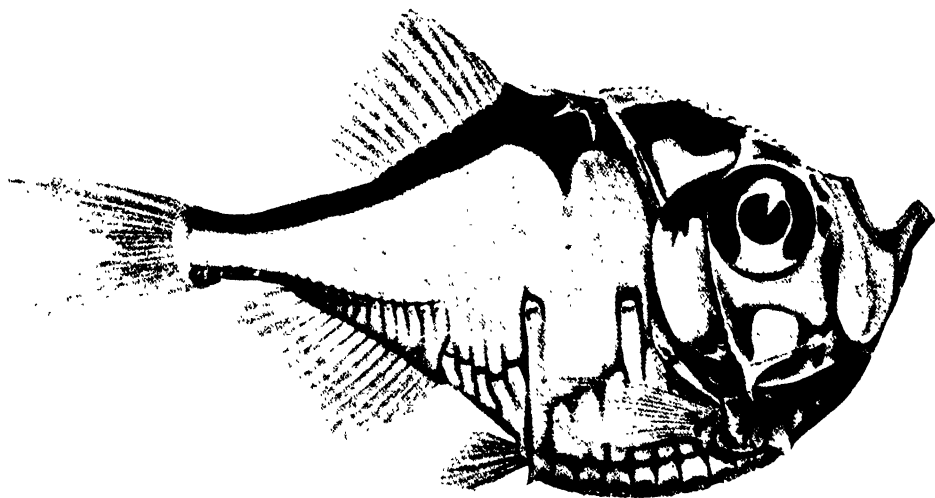


Fig. 63. *Polyipnus tridentifer*.

Fishes of this Family are recorded from considerable depths, but are believed to ascend to or near the surface at night. The markings on the lower half of the body are light-giving organs.

## ORDER INIOMI.

### FAMILY AULOPIDAE.

**AULOPUS** Cuvier, 1817 (*filamentosus*).

**AULOPUS PURPURISSATUS** Richardson (Sergeant Baker).

*Aulopus purpurissatus* Rich., Icon. Pisc., 1843, p. 6, pl. ii, fig. 3; McCoy, Prod. Zool. Viet., dec. vi, 1881, pl. liv, lv; Ogil., Edib. Fish. N.S.W., 1893, p. 166, pl. xl; Stead, Edib. Fish. N.S.W., 1908, p. 33, pl. ix; Roughley, Fish. Aust., 1916, p. 25, pl. iii.

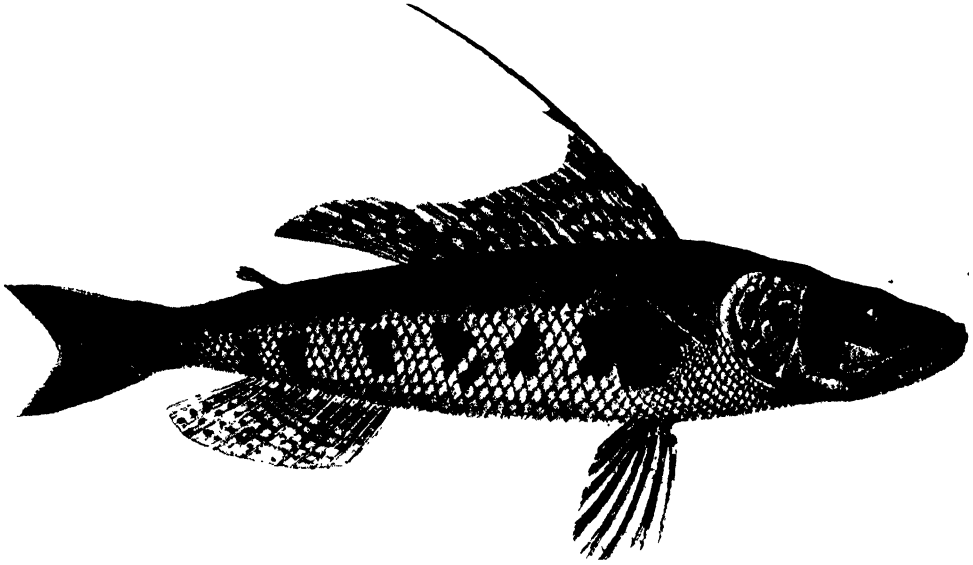


Fig. 64. *Aulopus purpurissatus*.

A good table fish, attaining a length of twenty-four inches. The long fin ray seen in the figure occurs in the male only.

## FAMILY MYCTOPHIDAE.

**MYCTOPHUM** Rafinesque, 1810 (*punctatum*).

**MYCTOPHUM CEPHALOTES** Castelnau (Lantern Fish).

*Neoscopelus cephalotes* Cast., Res. Fish. Aust., 1875, p. 46.

The Lantern Fishes bear a large number of photophores or light organs, disposed chiefly on the head and towards the lower side of the body.

**NEOSCOPELUS** Johnson, 1863 (*macrolepidotus*).

**NEOSCOPELUS MACROLEPIDOTUS** Johnson (Lantern Fish).

*Neoscopelus macrolepidotus* Johnson, P.Z.S., 1863, p. 44, pl. vii; Goode & Bean, U.S. Nat. Mus. sp. Bull., ii (Oceanic Ichth.), 1895, p. 93, pl. xxix, fig. 108, 109; McCull., Endeavour Res., ii, 1914, p. 90, pl. xvii; Vaill., Exp. Sci. Trav. & Tal., 1888, p. 119, pl. ix, fig. 2.

*Scopelus macrolepidotus* Günth., Cat. Fish. Brit. Mus., v, 1864, p. 414.

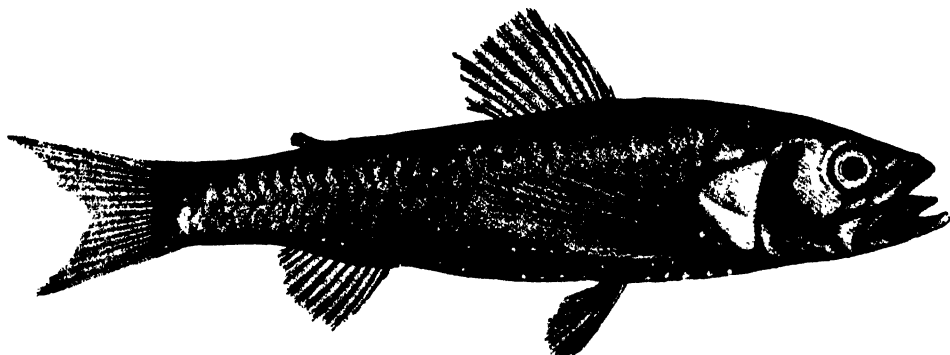


Fig. 66. *Neoscopelus macrolepidotus*.

## ORDER NEMATOGNATHI.

### FAMILY SILURIDAE.

#### **CNIDOGLANIS** Günther, 1864 (megastoma).

#### **CNIDOGLANIS MEGASTOMA** Richardson (Estuary Catfish).

*Plotosus megastomus* Rich., Zool. Ereb. & Terr., 1845, p. 31, pl. xxi, fig. 1-3.

*Cnidoglanis megastoma* Günth., Cat. Fish. Brit. Mus., v, 1864, p. 27; Ogil., Edib.

Fish. N.S.W., 1893, p. 164; Stead, Edib. Fish. N.S.W., 1908, p. 29, pl. vii.

*Chacroplosus decemfilis* Kner, Reise Novara Fische, 1867, p. 300, pl. xii, fig. 1.

?*Ostophyccephalus duriceps* Ogil., P.L.S., N.S.W., xxiv, 1899, p. 156.

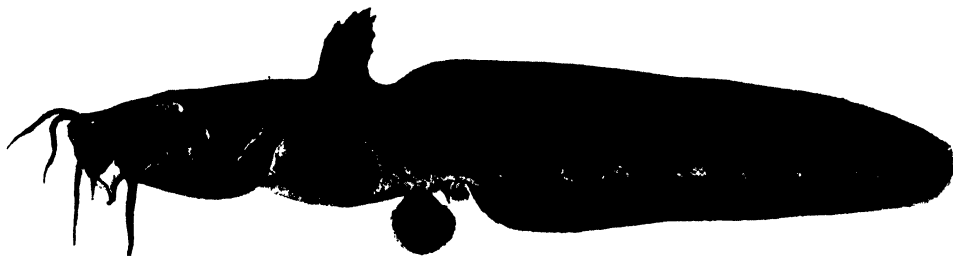


Fig. 67. *Cnidoglanis megastoma*.

A good-flavoured fish, but unsaleable owing to its prejudicial appearance, excepting at a nominal price to Asiatics. In our waters the fish is somewhat liable to a peculiar condition, in which the body is emaciated and the fins shrunk and hardened. Such a specimen appears to have been the foundation of Ogilby's *Ostophyccephalus duriceps*.

**TANDANUS** Mitchell, 1838 (*tandanus*).**TANDANUS TANDANUS** Mitchell (Fresh-water Catfish, Pamori).

*Plotosus (Tandanus) tandanus* Mitch., Exped. Aust. (ed. i), i, 1838, p. 95, pl. v, fig. 2.

*Copidoglanis tandanus* Günth., Cat. Fish. Brit. Mus., v, 1864, p. 26; Stead, Fish. Aust., 1906, p. 39, pl. i.

*Tandanus tandanus* Roughley, Fish. Aust., 1916, p. 19, pl. ii.

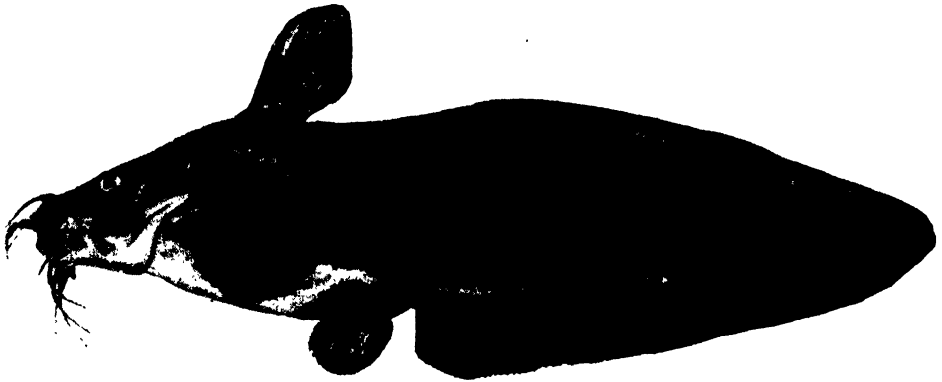


Fig. 68. *Tandanus tandanus*.

Said to be much better food than the Estuary Catfish, and frequently sold under some other name after removal of its tell-tale features. This fish makes a nest and guards its eggs.

**NEOPLOTOSUS** Castelnau, 1875 (*waterhousii*).**NEOPLOTOSUS WATERHOUSII** Castelnau (S. Australian Catfish).

*Neoplotosus waterhousii* Cast., Res. Fish. Aust., 1875, p. 45.

**NEOSILURUS** Steindachner, 1867 (*hyrtlil*).**NEOSILURUS HYRTLII** Steindachner (Central Australian Catfish).

*Ncosilurus hyrtlil* Steind., Sitz. Akad. Wiss. Wien, lv, 1867, p. 14, pl. i, fig. 3.

*Silurichthys australis* Cast., Res. Fish. Aust., 1875, p. 45.

?*Neosilurus australis* Cast., P.L.S., N.S.W., ii, 1878, p. 239.

?*Cainosilurus australis* MacI., P.L.S., N.S.W., vi, 1881, p. 211.

*Plotosus argenteus* Zietz, Rep. Horn Exped., ii, 1896, p. 410, pl. xvi, fig. 7.

*Ncosilurus argenteus* Zietz, T.R.S., S.A., xxxii, 1908, p. 296.



Fig. 70. *Neosilurus hyrtlii*.

In the last quoted paper, Zietz erroneously presumed that *N. hyrtlii* has but six barbels. Castelnau's count of a similar number in his *N. australis* may be due to imperfections in the single specimen examined, or to his characteristic carelessness.

## ORDER SYMBRANCHII.

### FAMILY SYMBRANCHIDAE.

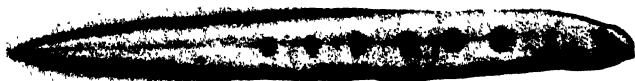
**CHEILOBRANCHUS** Richardson, 1845 (dorsalis).

**CHEILOBRANCHUS RUFUS** Macleay (Shore Eel).

*Chilobranchus rufus* MacL., P.L.S., N.S.W., vi, 1881, p. 266; Waite, Rec. Aust.

Mus., vi, 1906, p. 195, pl. xxxvi, fig. 1.

*Symbranchus bengalensis* Zietz, T.R.S., S.A., xxxii, 1908, p. 296 (not Bleek.).

Fig. 71. *Cheilobranchus rufus*.

This little fish, the relationship of which is somewhat doubtful, is coloured green when alive; it changes to red in certain preservatives, hence the name *rufus*.

## ORDER APODES.

### FAMILY ANGUILLIDAE.

**ANGUILLA** Shaw, 1803 (*anguilla*).

**ANGUILLA AUSTRALIS** Richardson (Short-finned Eel).

*Anguilla australis* Rich., P.Z.S., 1841, p. 22 and Zool. Ereb. & Terr., 1848, p. 112 pl. xlv, fig. 1-6.

Fig. 72. *Anguilla australis*.

Eels are essentially marine fishes, and though this and the Long-finned Eel probably spend the greater part of their lives in fresh-water lakes or rivers, they descend to the sea for breeding purposes.

**ANGUILLA REINHARDTII Steindachner** (Long-finned Eel).

*Anguilla reinhardtii* Steind., Sitz. Akad. Wiss. Wien, lv, 1867, p. 15, text fig. (head); Ogil., Edib. Fish. N.S.W., 1893, p. 187 and P.L.S., N.S.W., xxii, 1898, p. 767; Stead, Edib. Fish. N.S.W., 1908, p. 31, pl. viii; Roughley, Fish. Aust., 1916, p. 22.

Fig. 73. *Anguilla reinhardtii*.

Not sufficiently appreciated as food, but its freedom from small bones is an estimable quality. "Have them spitch-cock'd—or stew'd—they're too oily when fried!"

**FAMILY CONGRIDAE.**

**CONGER Houttuyn, 1764 (conger).**

**? CONGER WILSONI Bloch & Schneider** (Conger Eel).

*Gymnothorax wilsoni* Bl. & Schn., Syst. Ichth., 1801, p. 529.

*Conger wilsoni*? Cast., P.Z.S., Vict., i, 1872, p. 193.



Fig. 74. *Conger wilsoni*.

Scarcely distinguishable from the European Conger, which is an excellent food fish and the foundation of the famous turtle soup, to which the turtle furnishes only the garnish and the name.

#### FAMILY ECHELIDAE.

**MURAENICHTHYS** Bleeker, 1853 (gymnopterus).

**MURAENICHTHYS BREVICEPS** Günther (Slender Eel).

*Muraenichthys macropterus* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 43 (not Bleek.);

*Muraenichthys breviceps* Günth., A.M.N.H., (4), xvii, 1876, p. 401; McCull., Endeavour Res., i, 1911, p. 21, fig. 7.

#### ORDER SOLENICHTHYES.

##### FAMILY MACRORHAMPHOSIDAE.

**CENTRISCOPS** Gill, 1862 (humerosus).

**CENTRISCOPS HUMEROSUS** Richardson (Bellows Fish).

*Centriscus humerosus* Rich., Zool. Ereb. & Terr., 1846, p. 56, pl. xxxiv, fig. 5, 6.

*Centriscops humerosus* Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 234 (footnote); McCull., Endeavour Res., ii, 1914, p. 90.

*Centriscus (Limiculina) humerosus* Fowl., Proc. Acad. Nat. Sci. Phil., lix, 1907, p. 425.

*Centriscoops humerosus* var. *obliquus* Waite, Rec. Cant. Mus., i. 1911, p. 170, pl. xxvi.

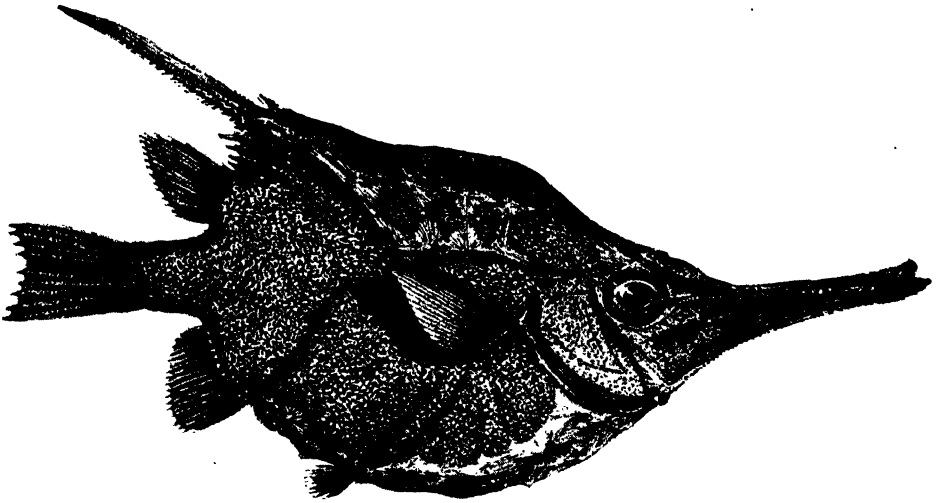


Fig. 76. *Centriscoops humerosus*.

None of the members of this Order is of economic value.

#### FAMILY SYNGNATHIDAE.

**SYNGNATHUS** Linnaeus, 1758 (aeus).

**SYNGNATHUS POECILOLAEMUS** Peters (Long-snouted Pipefish).



Fig. 77. *Syngnathus poecilolaemus*, male and female.

*Syngnathus poecilolaemus* Peters, Monatsb. Akad. Wiss. Berlin, 1869, p. 458;  
 Dunck., Faun. Südwest Aust., ii, 1909, p. 245; Waite & Hale, Rec. S. Aust.  
 Mus., i, 1921, p. 295, fig. 39.

*Syngnathus modestus* Sauv., Bull. Soc. Phil. (7), iii, 1879, p. 209 (not Günth.),  
*Corythoichthys poecilolaemus* McCull., Rec. W. Aust. Mus., i, 1912, p. 82, fig. 2.

**SYNGNATHUS PHILLIPI Lucas** (Medium-snouted Pipefish).

*Syngnathus phillipi* Lucas, P.R.S., Viet. (2), iii, 1891, p. 12; Dunck. Faun.  
 Südwest Aust., ii, 1909, p. 245; Waite & Hale, Rec. S. Aust. Mus., i, 1921,  
 p. 297, fig. 40.

*Corythoichthys phillipi* McCull., Endeavour Res., i, 1911, p. 26, fig. 10.



Fig. 78. *Syngnathus phillipi*, male and female.

**SYNGNATHUS VERCOI Waite & Hale** (Little Pipefish).

*Ichthyocampus filum* Zietz, T.R.S., S.A., xxxii, 1908, p. 298 (not Günth.).  
*Syngnathus vercoi* Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 208, fig. 41.

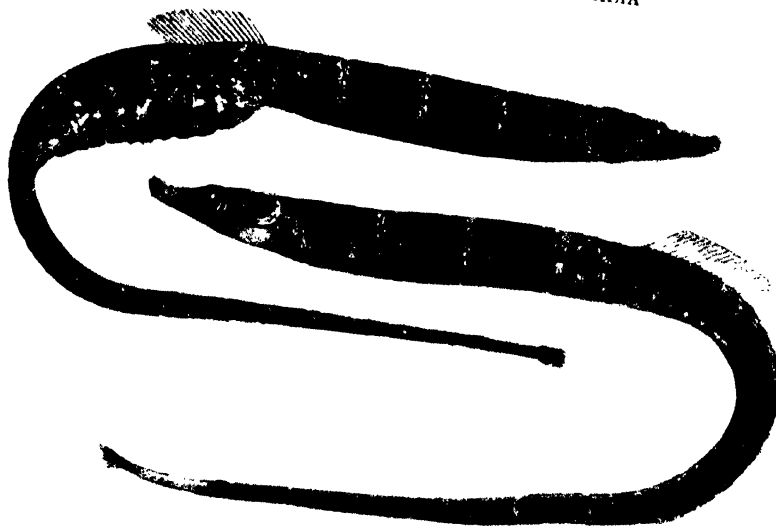


Fig. 79. *Syngnathus vereoi*, male and female.

**SYNGNATHUS CURTIROSTRIS** Castelnau (Short-snouted Pipefish).

*Syngnathus curtirostris* Cast., P.Z.S., Viet., i, 1872, p. 243 and ii, 1873, p. 79; Dunck., Faun. Südwest Aust., ii, 1909, p. 244; McNill & Waite, Rec. S. Aust. Mus., i, 1918, p. 39, pl. v, fig. 1; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 300, fig. 42.

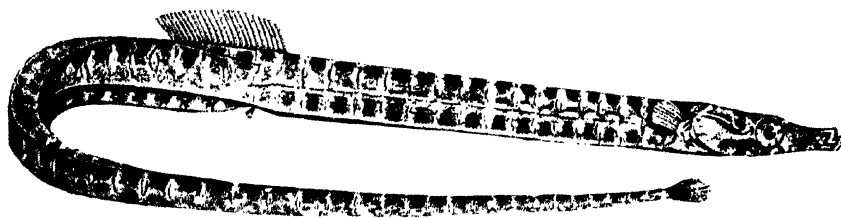


Fig. 80. *Syngnathus curtirostris*.

**LEPTONOTUS** Kaup, 1853 (*blainvillianus*).

**LEPTONOTUS COSTATUS** Waite & Hale (Deep-bodied Pipefish).

*Leptonotus costatus* Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 301, fig. 43.

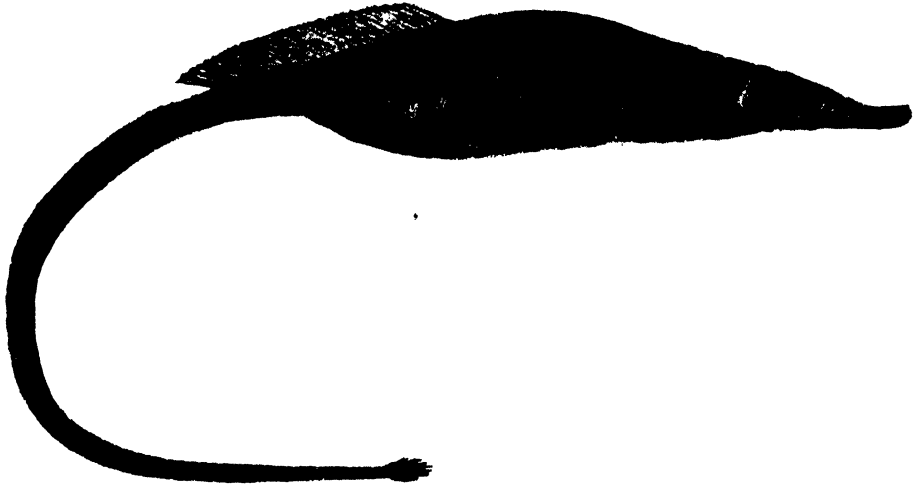
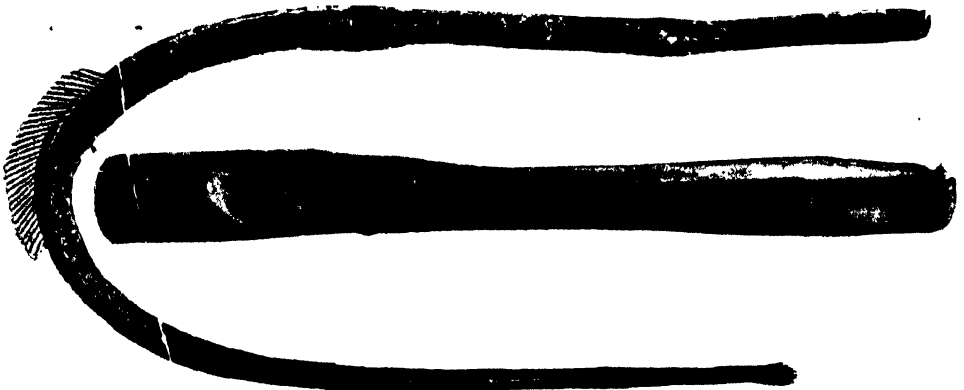
Fig. 81. *Leptonotus costatus*.**HISTIOGAMPHELUS McCulloch, 1914 (briggsii).****HISTIOGAMPHELUS ROSTRATUS Waite & Hale** (Knife-snouted Pipefish).*Syngnathus semifasciatus* Zietz, T.R.S., S.A., xxxii, 1908, p. 298 (not Günth.).*Doryichthys heterosoma* Zietz, *op. cit.*, p. 299 (not Bleek.).*Histiogamphelus rostratus* Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 303, fig. 44.Fig. 82. *Histiogamphelus rostratus*.**ICHTHYOCAMPUS Kaup, 1853 (belcheri).****ICHTHYOCAMPUS CRISTATUS McCulloch & Waite** (Crested Pipefish).*Ichthyocampus cristatus* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 40,

fig. 26; Waite &amp; Hale, Rec. S. Aust. Mus., i, 1921, p. 304, fig. 45.

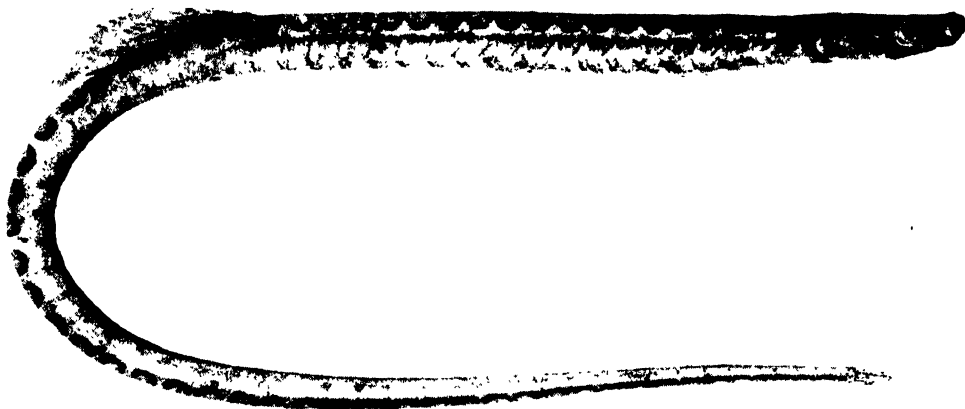


Fig. 83. *Ichthyocampus cristatus*.

**LISSOCAMPUS** Waite & Hale, 1921 (*caudalis*).

**LISSOCAMPUS CAUDALIS** Waite & Hale (Smooth Pipefish).

*Lissocampus caudalis* Waite & Hale, Rec. S. Aust., Mus., i, 1921, p. 306, fig. 46.



Fig. 84. *Lissocampus caudalis*.

**LEPTOICHTHYS** Kaup, 1853 (*fistularius*).

**LEPTOICHTHYS FISTULARIUS** Kaup (Brush-tailed Pipefish).



*Leptoichthys fistularius* Kaup, Arch. f. Naturg., xix, 1853, p. 232 and Cat. Lophob., 1856, p. 52; Dunck., Faun. Südwest Aust., ii, 1909, p. 234; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 307, fig. 47.

*Leptoichthys castelnaui* Mael., P.L.S., N.S.W., vi, 1881, p. 295.

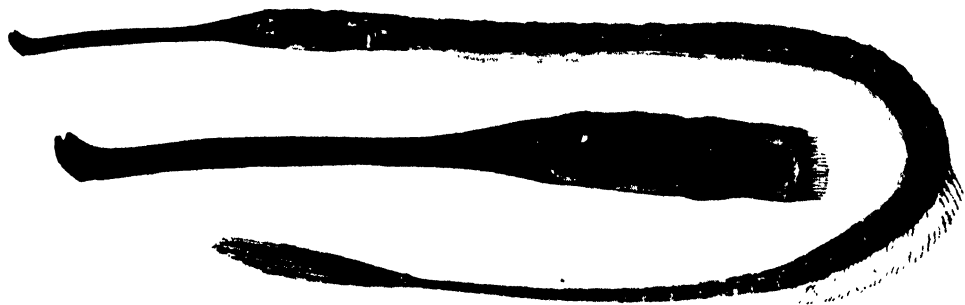


Fig. 85. *Leptoichthys fistularius*.

**STIGMATOPORA Kaup, 1853 (argus).**

**STIGMATOPORA ARGUS Richardson (Spotted Pipefish).**

*Syngnathus argus* Rich., P.Z.S., 1840, p. 29 and T.Z.S., iii, 1849, p. 183, pl. vii, fig. 2.

*Stigmatophora argus* Kaup, Arch. f. Naturg. xix, 1853, p. 233 and Cat. Lophob., 1856, p. 53; Dunck., Fauna Südwest Aust., ii, 1909, p. 239; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 308, fig. 48.

*Stigmatophora olivacea* Cast., P.Z.S., Viet., i, 1872, p. 244 and ii, 1873, p. 77; Ogil., Mem. Qld. Mus., i, 1912, p. 36.



Fig. 86. *Stigmatopora argus*, female and male.

*Gastroteus gracilis* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 44.

*Stigmatophora unicolor* Cast., Res. Fish. Aust., 1875, p. 49.

*Stigmatophora depressiuscula* and *S. gracilis* MacL., P.L.S., N.S.W., vi, 1882, p. 299.

*Stigmatophora argus* var. *brevicaudata* Lucas, P.R.S., Viet., iii (n.s.), 1891, p. 14.

**STIGMATOPORA NIGRA Kaup** (Wide-bodied Pipefish).

*Stigmatopora nigra* Kaup, Arch. f. Naturg., xix, 1853, p. 233 and Cat. Lophob., 1856, p. 53; Dunck., Fauna Südwest Aust., ii, 1909, p. 239; McCull., Aust. Zool., i, 1914, p. 29, fig. 1, 2, 3 (portions); Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 311, fig. 49.

*Stigmatophora boops* Cast., P.Z.S., Viet., i, 1872, p. 203.

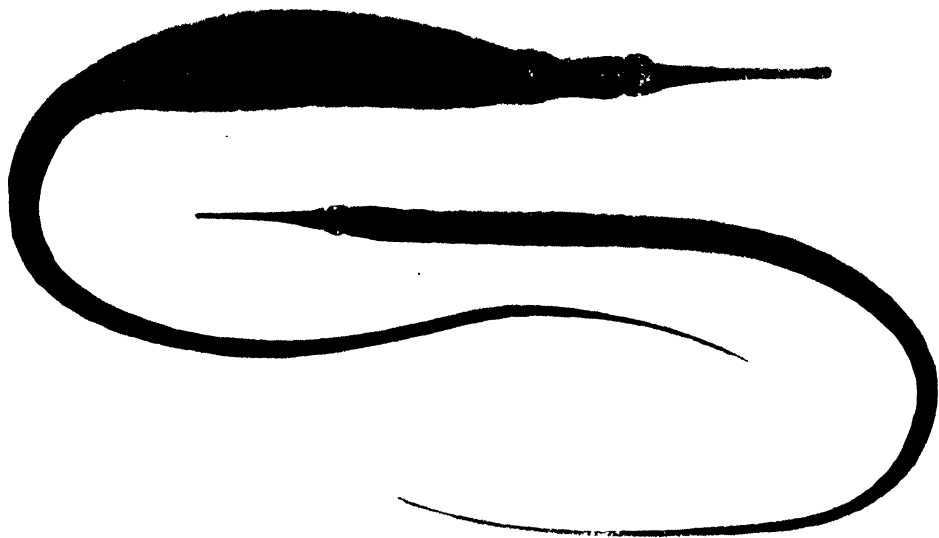


Fig. 87. *Stigmatopora nigra*, female and male.

**SOLEGNATHUS Swainson, 1839 (hardwickii).**

**SOLEGNATHUS ROBUSTUS McCulloch** (Pipe-horse).

*Solenognathus spinosissimus* Zietz, T.R.S., S.A., xxxii, 1908, p. 299 (not Günth.).



Fig. 88. *Solegnathus robustus*.

*Solegnathus robustus* McCull., Endeavour Res., i, 1911, p. 28, pl. ix, fig. 2; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 312, fig. 50.

**PHYLLOPTERYX** Swainson, 1839 (foliatus).

**PHYLLOPTERYX FOLIATUS** Shaw (Common Sea Dragon).

*Syngnathus foliatus* Shaw, Gen. Zool., v, 1804, p. 456, pl. clxxx.

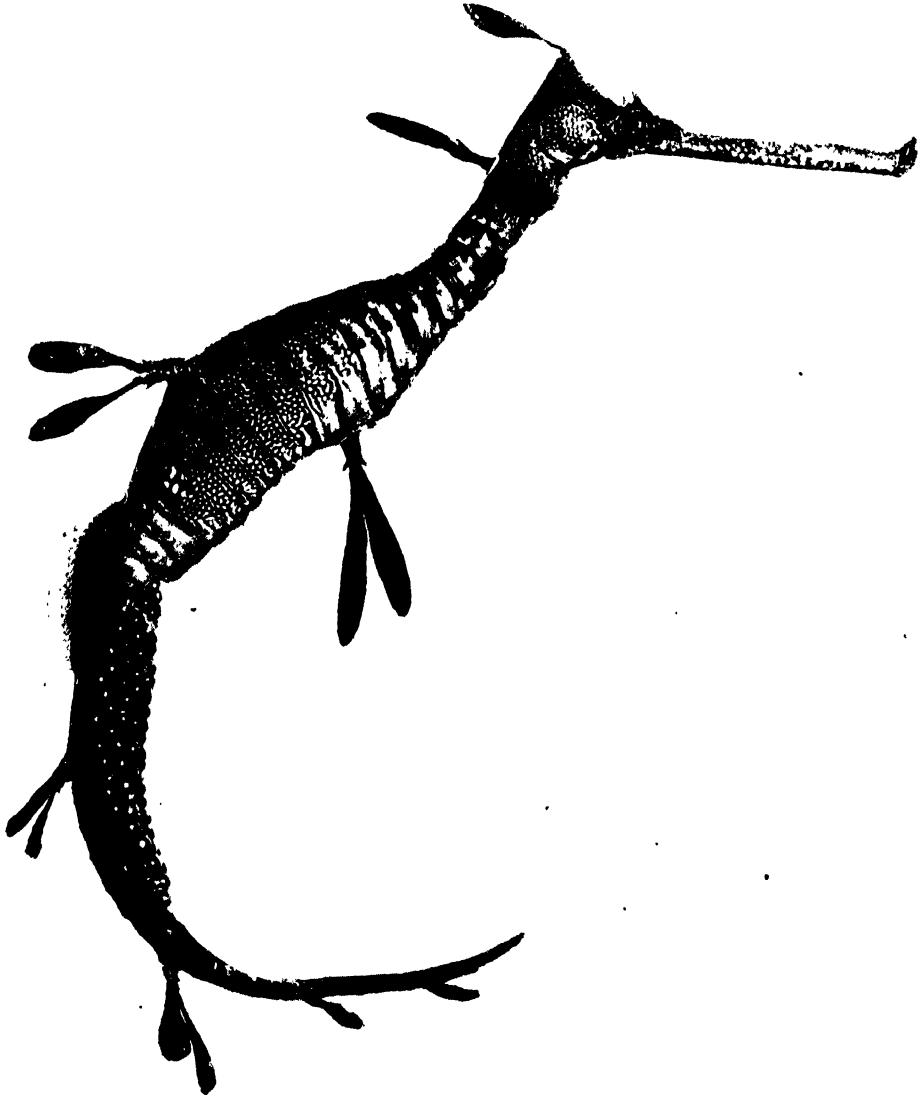


Fig. 89. *Phyllopteryx foliatus*, male with eggs.

*Syngnathus taeniopterus* Lacep., Ann. Mus., iv, 1804, p. (184-211), pl. lviii, fig. 3.

*Phyllopteryx foliatus* Swains., Nat. Hist. Fish., ii, 1839, p. 332, fig. 109; Günth., P.Z.S., 1865, p. 327, pl. xiv; McCoy, Prod. Zool. Viet., dec. vii, 1882, pl. lxv, fig. 1; Dunck., Faun. Südwest Aust., ii, 1909, p. 236; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 313, fig. 51.

*Phyllopteryx elongatus* Cast., P.Z.S., Viet., i, 1872, p. 243 and ii, 1873, p. 70.

*Phyllopteryx altus* McCoy, Prod. Zool. Viet., dec. vii, 1882, p. 20.

Males of the Pipe-fishes, Sea-horses, and other forms comprising the Order Lophobranchii, carry the eggs glued to the underside of the body or tail, or in a more or less perfect pouch developed thereon. The accompanying photograph of a male Sea-dragon shows a complement of eggs attached to the underside of the tail.

**PHYLLOPTERYX EQUES** Günther (Leafy Sea Dragon).



Fig. 90. *Phyllopteryx eques*.

*Phyllopteryx eques* Günth., P.Z.S., 1865, p. 327, pl. xv; Dunck., Faun. Südwest Aust., ii, 1909, p. 237; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 315, fig. 52.  
*Phycodurus eques* Gill, Proc. U.S. Nat. Mus., xviii, 1895, p. 159.

**ACENTRONURA Kaup, 1853 (gracilissima).**

**ACENTRONURA AUSTRALE Waite & Hale (Little Pipe-horse).**

*Acentronura australe* Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 317, fig. 53.

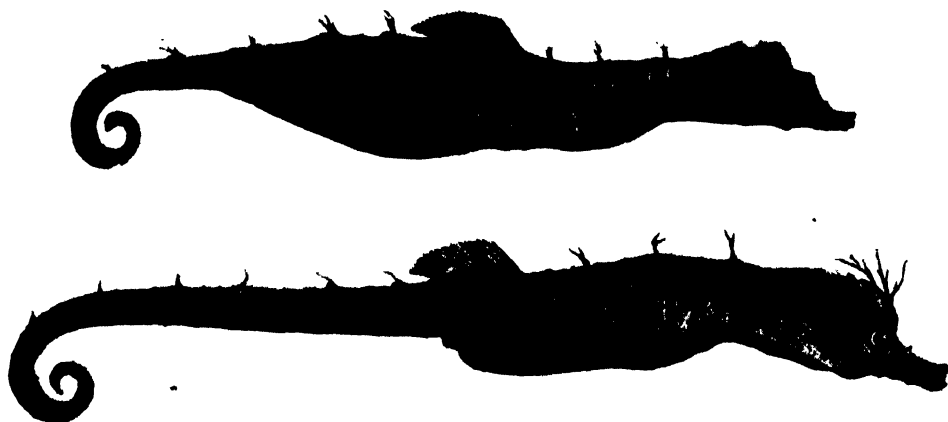


Fig. 91. *Acentronura australe*, male and female.

**HIPPOCAMPUS Rafinesque, 1810 (hippocampus).**

**HIPPOCAMPUS ABDOMINALIS Lesson (Sea-horse).**

*Hippocampus abdominalis* Less., in Ferussac, Bull. Sci. Nat., xi, 1827, p. 127; Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 48, pl. fig. 4; Kaup, Cat. Lophob., 1856, p. 17, pl. iii, fig. 3; Dunck., Faun. Südwest Aust., ii, 1909, p. 247; Waite, Rec. Cant. Mus., i, 1911, p. 175, pl. xxviii; McCull., Endeavour Res., i, 1911, p. 29, pl. vi, fig. 1; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 319, fig. 54.  
*Hippocampus graciliformis* McCull., Endeavour Res., i, 1911, p. 29, pl. vi, fig. 2.

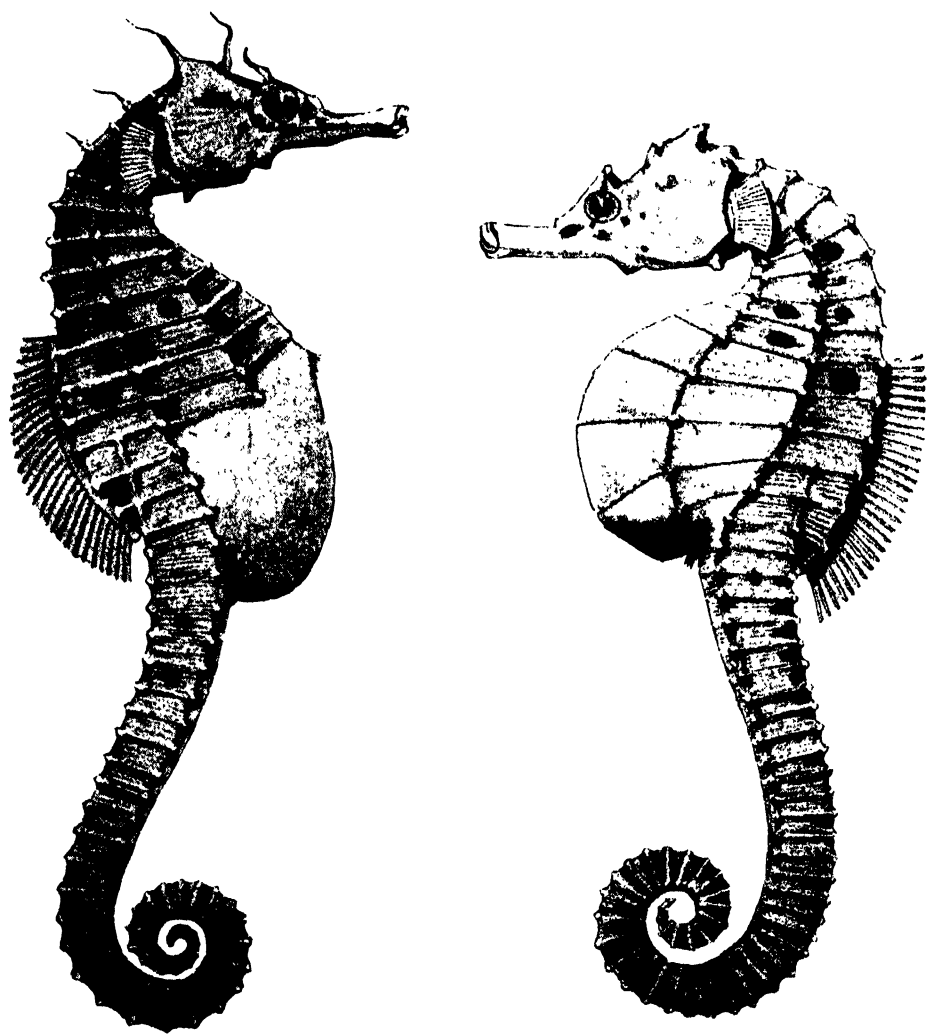


Fig. 92. *Hippocampus abdominalis*, male and female.

**HIPPOCAMPUS NOVAE-HOLLANDIAE Steindachner** (Common Sea-horse).

*Syngnathus hippocampus* Shaw, in White's Voy. N.S.W., 1790, p. 295, pl. 1, fig. 2 (not Linn.).

*Hippocampus novae-hollandiae* Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 474, pl. i, fig. 2; Dunck., Faun. Südwest Aust., ii, 1909, p. 248; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 320, fig. 55.

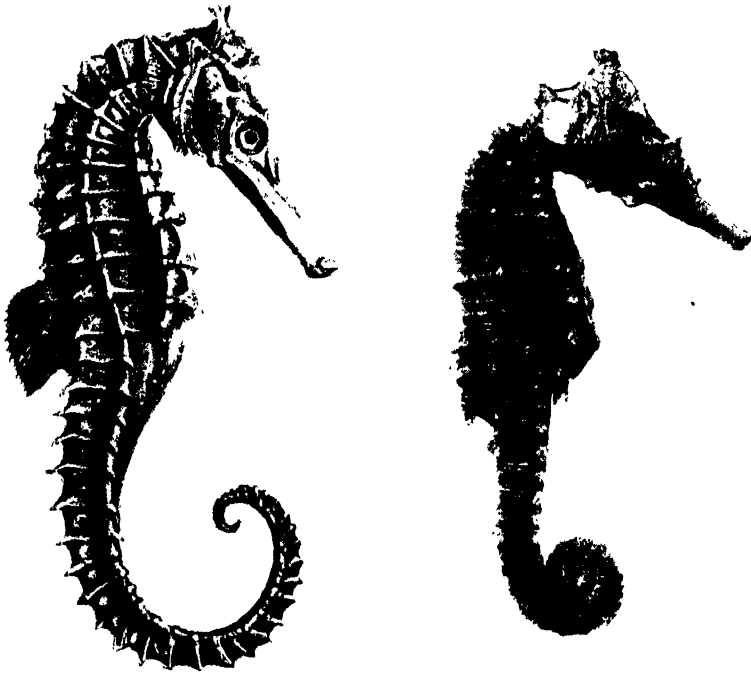


Fig. 93. *Hippocampus novae-hollandiae*, male and female.

**HIPPOCAMPUS BREVICEPS Peters** (Short-headed Sea-horse).

*Hippocampus breviceps* Peters, Mon. Akad. Wiss. Berlin, 1869, p. 710; McCoy, Prod. Zool. Viet., dec. vii, 1882, pl. lxxv, fig. 2; Dunck., Faun. Südwest Aust., ii, 1909, p. 247; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 321, fig. 56.

*Hippocampus tuberculatus* Cast., Res. Fish, Aust., 1875, p. 48.

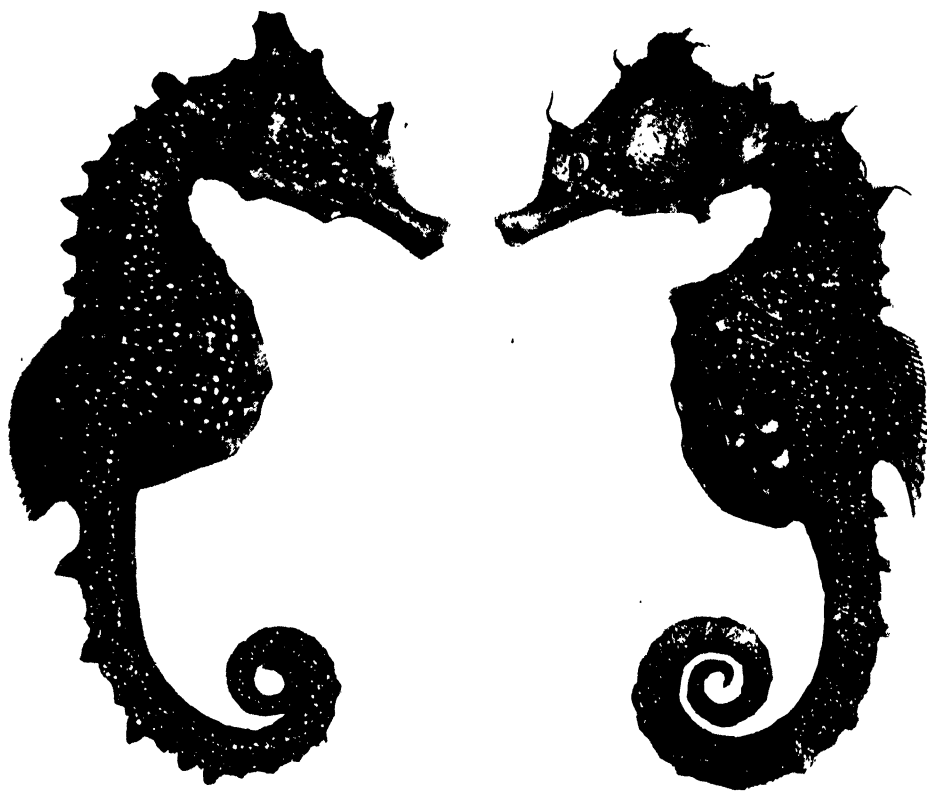


Fig. 94. *Hippocampus breviceps*, male and female.

## ORDER HYPOSTOMIDES.

### FAMILY PEGASIDAE.

**ACANTHOPEGASUS** McCulloch, 1915 (*lancifer*).

**ACANTHOPEGASUS LANCIFER** Kaup.

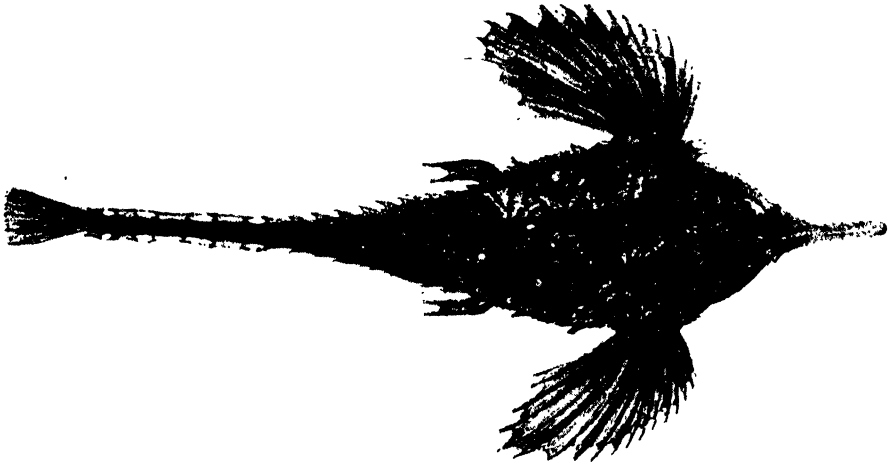
*Pegasus natans* Kaup, Cat. Lophob., 1856, p. 4, pl. i, fig. 2 (not Linn.).

*Pegasus lancifer* Kaup, Arch. f. Naturg., xxii, 1861, p. 116, 117.

*Parapegasus lancifer* Dum., Hist. Nat. Poiss., ii, 1870, p. 294.

*Acanthopegasus lancifer* McCull., Endeavour Res., iii, 1915, p. 106, fig. 1.



Fig. 95. *Acanthopogon loricatus*.**ORDER SYNENTOGNATHI.****FAMILY SCOMBRESOCIDAE.****SCOMBRESOX** Lacepède, 1803 (*camperii*).**SCOMBRESOX FORSTERI** Cuvier & Valenciennes (Billfish, Skipper).

*Scombresox forsteri* Cuv. & Val., Hist. Nat. Poiss., xviii, 1846, p. 481.

*Scomberesox saurus* var. *forsteri* McCoy, Prod. Zool. Viet., dec. xiv, 1887, pl. cxxxv, fig. 2.

Fig. 96. *Scombresox forsteri*.

Frequently netted with Garfishes, to which it is allied.

**FAMILY EXOCOETIDAE.****CYPSELURUS** Swainson, 1839 (*nuttalii*).**CYPSELURUS CRIBROSUS** Kner (Flying Fish).

*Erocoetus unicolor*? Cuv. & Val., vel *cribrosa* Kner, Reise Novara, i, 1867, p. 325 (not Cuv. & Val.).

*Eronautes fulvipes* and *E. cribrosus* Ogil., P.R.S., Qld., xxi, 1908, p. 8, 13.

*Cypselurus cribrosus* McCull., Mem. Qld. Mus., v, 1916, p. 59, pl. vii.

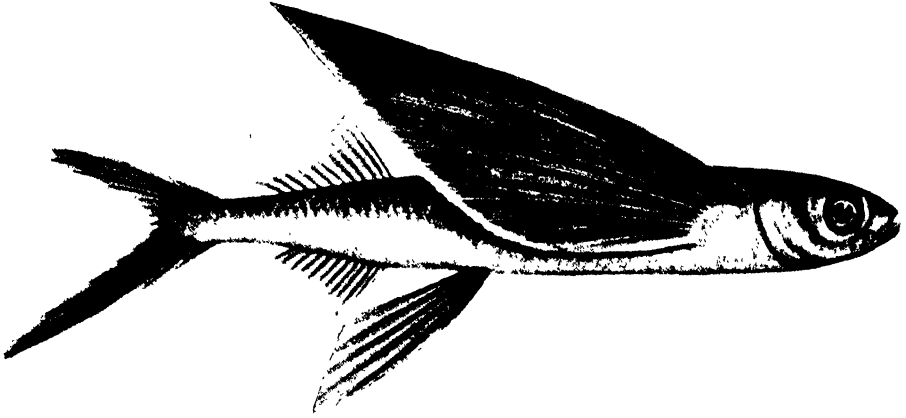


Fig. 97. *Cypselurus cribrerosus*.

FAMILY HEMIRHAMPHIDAE.

**HYPORHAMPHUS** Gill, 1859 (*tricuspidatus*).

**HYPORHAMPHUS INTERMEDIUS** Cantor (Garfish).

*Hemirhamphus intermedius* Cant., A.M.N.H., ix, 1842, p. 485; McCoy, Prod. Zool. Viet., dec. xiv, 1887, pl. cxxxv, fig. 1; Ogil., Edib. Fish. N.S.W., 1893, p. 172, pl. xlii; Roughley, Fish. Aust., 1916, p. 27, pl. iv.

*Hemirhamphus melanochir* Cuv. & Val., Hist. Nat. Poiss., xix, 1846, p. 41.

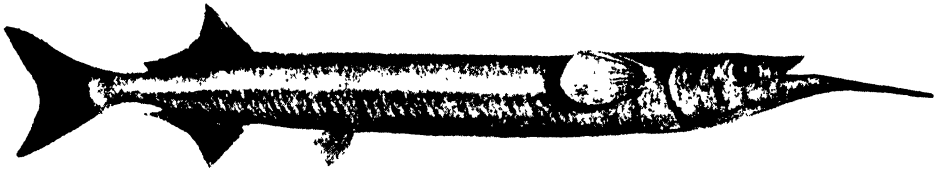


Fig. 98. *Hyporhamphus intermedius*.

A recognized breakfast fish and would be more appreciated but for the presence of small hair-like bones.

ORDER ANACANTHINI.

FAMILY MACROURIDAE.

**NEMATONURUS** Günther, 1887 (*armatus*).

**NEMATONURUS ARMATUS** Hector.

*Macrurus armatus* Hect., A.M.N.H. (4), xv, 1875, p. 81 and T.N.Z. Inst., vii, 1875, p. 249, pl. xi, fig. 78a.

*Coryphaenoides variabilis* Günth., A.M.N.H. (5), ii, 1878, p. 27.

*Nematonurus armatus* Günth., Chall. Rep., xxii, 1887, p. 150, pl. xl, fig. A.

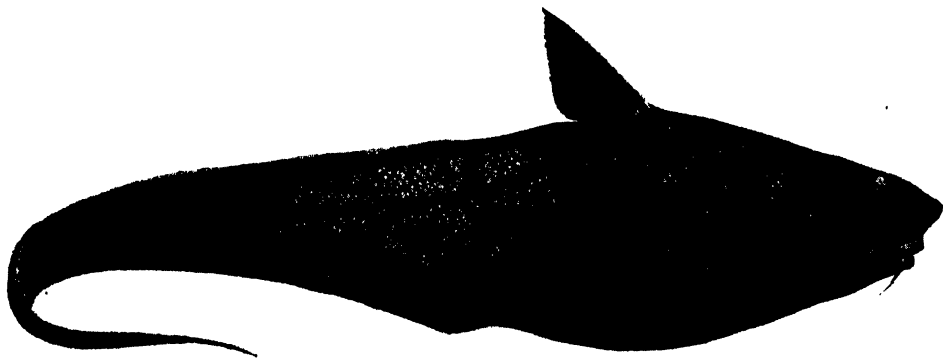


Fig. 99. *Nematonurus armatus*.

This and the following species are known only from very deep water.

**OPTONURUS** Günther, 1887 (*denticulatus*).

**OPTONURUS DENTICULATUS** Richardson.

*Macrourus denticulatus* Rich., Zool. Ereb. & Terr., 1848, p. 53, pl. xxxii, fig. 1-3.

*Coryphaenoides denticulatus* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 396.

*Optonurus denticulatus* Günth., Chall. Rep., xxii, 1887, p. 147.

## FAMILY GADIDAE.

**LOTELLA** Kaup, 1858 (*phycis*).

**LOTELLA CALLARIAS** Günther (*Beardie*).

*Lotella callarias* Günth., A.M.N.H. (3), xi, 1863, p. 116; McCoy, Prod. Zool.

Vict., dec. ii, 1878, pl. xix; Ogil., Edib. Fish. N.S.W., 1893, p. 152, pl. xxxvii;

Roughley, Fish. Aust., 1916, p. 47, pl. x.

*Lotella schuettei* Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 466, pl. iii, fig. 1.

*Lotella marginata* Mael., P.L.S., N.S.W., vi, 1881, p. 114 (not Günth, 1878).

*Lotella swanii* Johnston, P.R.S., Tasm., 1883, p. 126.

*Lotella limbata* Ogil., Cat. Fish. N.S.W., 1886, p. 47.

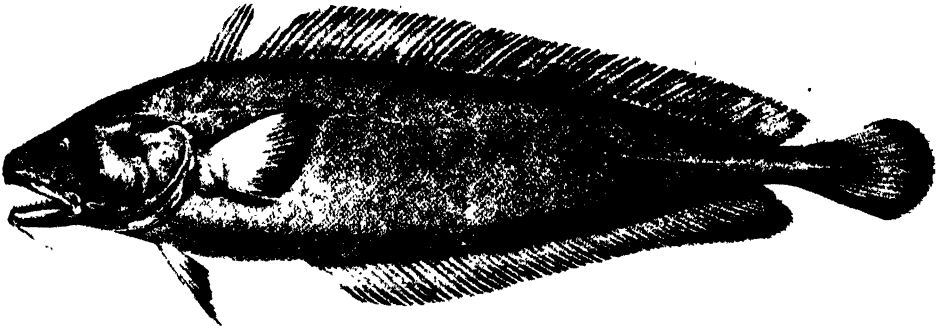


Fig. 101. *Lotella callarias*.

Not regarded as a prime fish: the flesh is rather soft and of poor keeping quality.

**PHYSICULUS** Kaup, 1858 (*dalwigkii*).

**PHYSICULUS BARBATUS** Günther (Cod).

*Pseudophysius barbatus* Günth., A.M.N.H. (3), xi, 1863, p. 116; McCoy, Prod.

Zool. Viet., dec. ii, 1878, pl. xx.

*Physiculus palmatus* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 38.

*Lotella grandis* Rams., P.L.S., N.S.W., v, 1881, p. 462.

*Physiculus barbatus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 24.

*Physiculus bachus* Stead, Edib. Fish. N.S.W., 1908, pl. xvi (not Forst.).

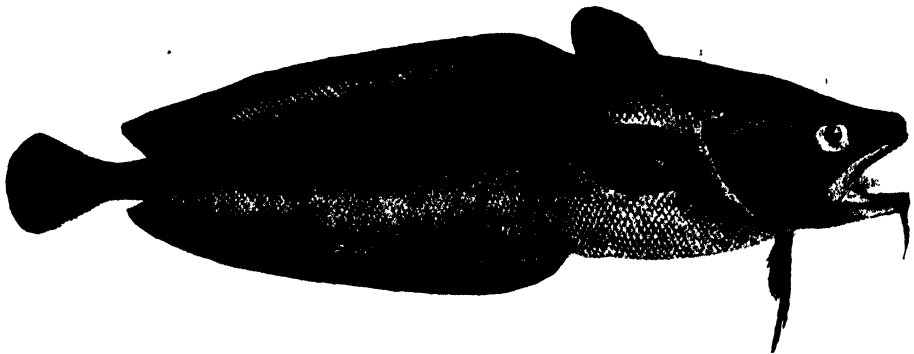


Fig. 102. *Physiculus barbatus*.

“The flesh is soft and not very good.”

**PHYSICULUS BACHUS** Forster (Red Cod).

*Lota bachus* Forst., in Bloch & Schneid., Syst. Ichth., 1801, p. 53.

*Lotu breviuscula* Rich., Zool. Ereb. & Terr., 1848, p. 61, pl. xxxviii, fig. 1, 2.

*Physiculus bachus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 24 and Rec. Cant. Mus., i, 1911, p. 183, pl. xxxi, fig. 1.

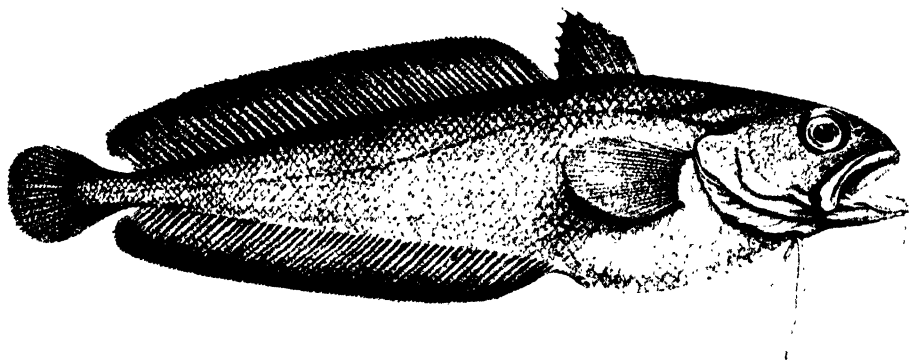


Fig. 103. *Physiculus bachus*.

Not recognized by fishermen as distinct from the foregoing.

## ORDER BERYCOMORPHI.

### FAMILY BERYCIDAE.

**TRACHICHTHODES** Gilchrist, 1903 (*spinosus*).

**TRACHICHTHODES LINEATUS** Cuvier & Valenciennes (Swallow-tail).

*Beryx lineatus* Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 226, pl. lx.

*Beryx mulleri* Klunz., Sitz. Akad. Wiss. Wien, lxxx, 1880, p. 359, pl. iii, fig. 1.

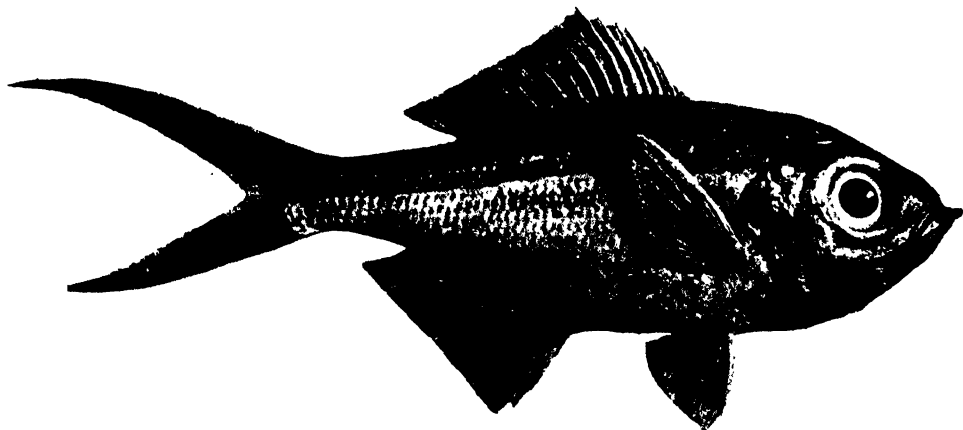


Fig. 104. *Trachichthodes lineatus*.

*Trachichthodes lineatus* Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 461, fig. (head).

An excellent and much esteemed food fish. The commonest fish taken on the "Simplon" trawling cruise, 1914, 700 lb. weight being netted in one haul.

**TRACHICHTHODES AFFINIS Günther (Nannygai).**

*Beryx affinis* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 13 and A.M.N.H. (5), xx, 1887, p. 238, fig. (snout); Ogil., Edib. Fish. N.S.W., 1893, p. 69, pl. xxi; Stead, Edib. Fish. N.S.W., 1908, p. 48, pl. xvii.

*Hoplopteryx affinis* Regan, A.M.N.H. (8), vii, 1911, p. 5, pl. i.

*Austroberyx affinis* McCull., Endeavour Res., i, 1911, p. 43, fig. 11.

*Trachichthodes affinis* Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 463; Roughley, Fish. Aust., 1916, p. 49, pl. xi.

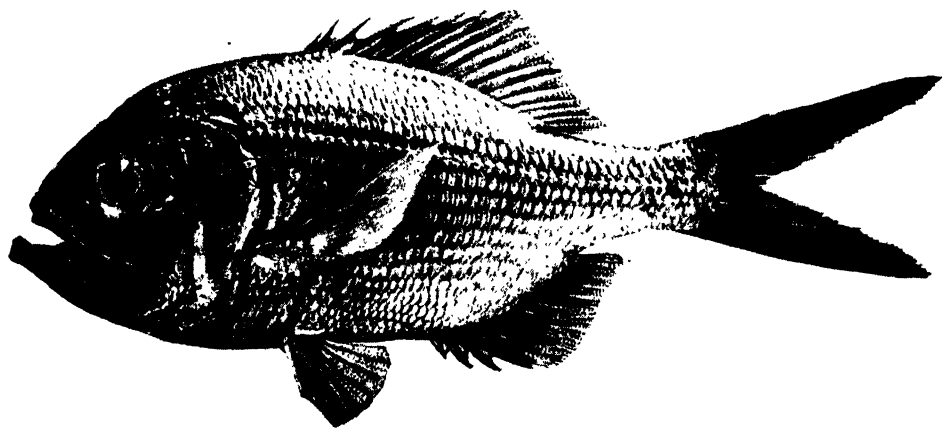


Fig. 105. *Trachichthodes affinis*.

The eastern representative of our Red Snapper, but recorded from South Australia.

**TRACHICHTHODES GERRARDI Günther (Red Snapper).**

*Beryx gerrardi* Günth., A.M.N.H. (5), xx, 1887, p. 238, fig. (snout).

*Austroberyx gerrardi* McCull., Endeavour Res., i, 1911, p. 41, pl. viii.

*Trachichthodes gerrardi* Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 463.

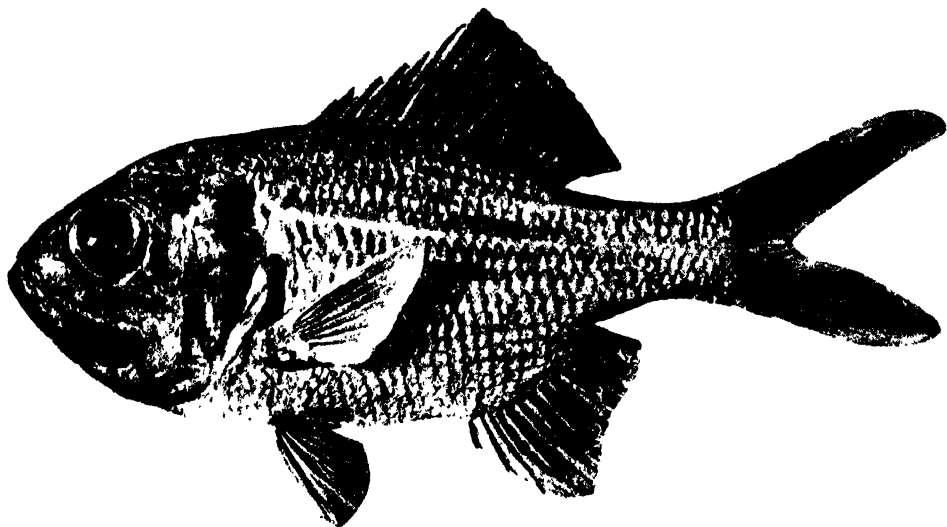


Fig. 196. *Trachichthodes gerrardi*.

An excellent and highly esteemed food fish, scarcely distinguishable from the Nannygai. All three species of the genus are of beautiful red colour.

#### FAMILY TRACHICHTHYIDAE.

**HOPLOSTETHUS** Cuvier & Valenciennes, 1829 (mediterraneus).

**HOPLOSTETHUS MEDITERRANEUS** Cuvier & Valenciennes.

*Hoplostethus mediterraneus* Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 469, pl. xeviii, bis; Steind. & Döder., Denks. Akad. Wiss. Wien, xlvii, 1883, p. 218, pl. i; Goode & Bean, Oceanic Ichth., 1895, p. 189, pl. lvi, fig. 208; Alcock, Illus. Zool. Investigator, 1895, pl. xiv, fig. 3.

*Trachichthys pretiosus* Lowe, P.Z.S., 1839, p. 77.

*Hoplostethus japonicus* Hilgend., Sitzb. Ges. Naturf. Freunde, Berlin, 1879, p. 78.

*Hoplostethus mediterraneus* var. *latus* McCull., Endeavour Res., ii, 1914, p. 97, fig. 5.

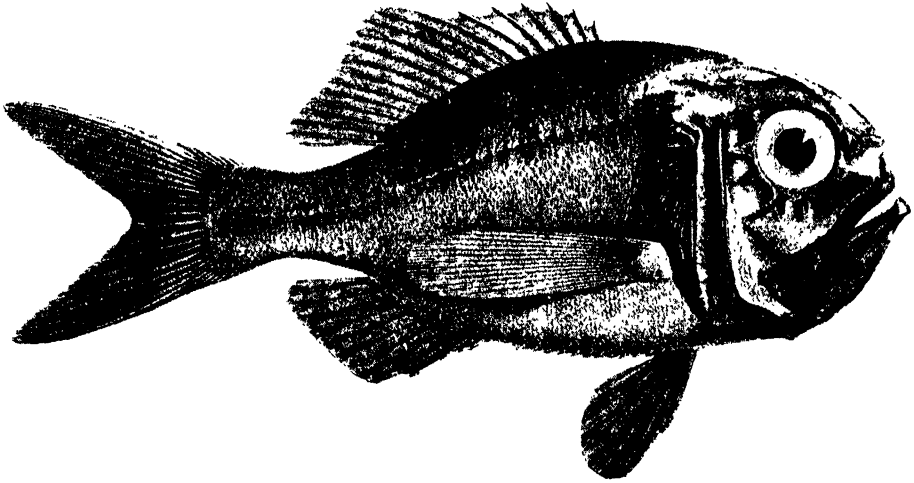


Fig. 107. *Hoplostethus mediterraneus*.

The fishes of this Family occur in deep water and are not netted for food.

**HOPLOSTETHUS INTERMEDIUS Hector.**

*Trachichthys intermedius* Hect., T.N.Z. Inst., vii, 1875, p. 245, pl. xi, fig. 18a;

Günth., Chall. Rep., xxii, 1887, p. 24, pl. v, fig. D.

*Hoplostethus intermedius* McCull., Endeavour Res., ii, 1914, p. 100, fig. 6.

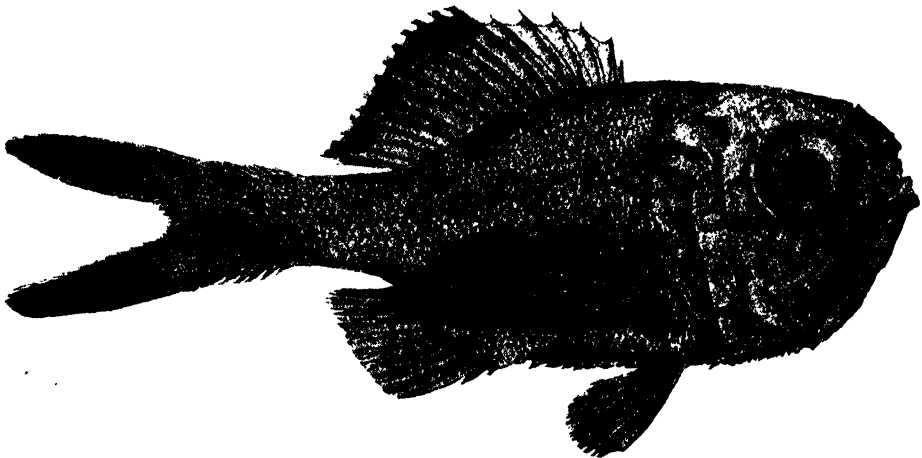


Fig. 108. *Hoplostethus intermedius*.



**HOPLOSTETHUS GIGAS McCulloch.**

*Hoplostethus gigas* McCull., Endeavour Res., ii, 1914, p. 101, pl. xix.

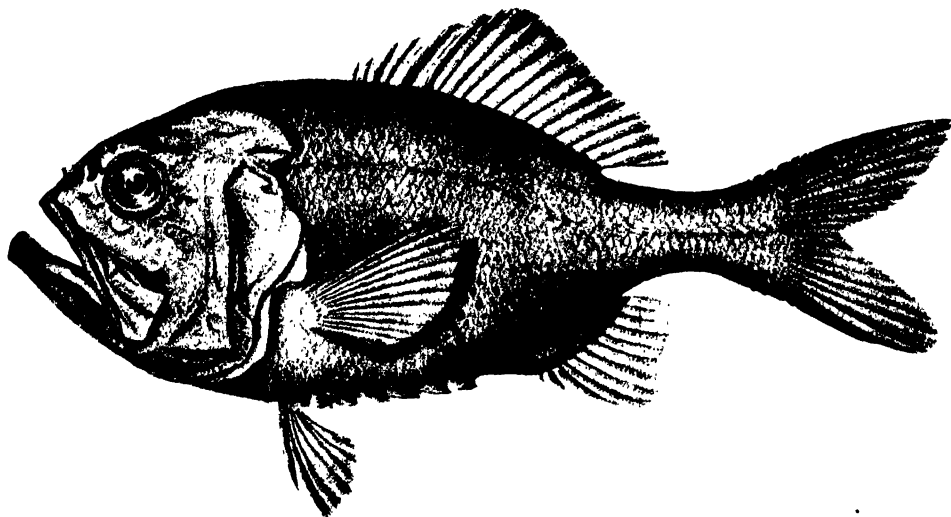


Fig. 109. *Hoplostethus gigas*.

**GEPHYROBERYX Boulenger, 1902 (darwinii).**

**GEPHYROBERYX DARWINII Johnson.**

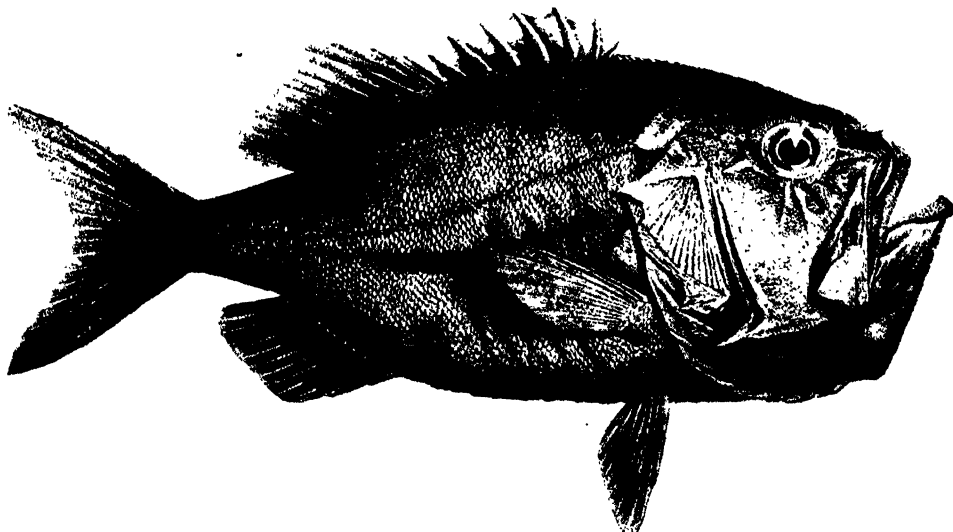


Fig. 110. *Gephyroberyx darwinii*.

*Trachichthys darwinii* Johnson, P.Z.S., 1866, p. 311, pl. xxxii; Goode & Bean, Oceanic Ichth., 1895, p. 188, pl. lvi, fig. 207.

*Gephyroberyx darwinii* Boul., A.M.N.H. (7), ix, 1902, p. 203; McCull., Endeavour Res., iv, 1916, p. 182.

**PARATRACHICHTHYS** Waite, 1899 (trailli).

**PARATRACHICHTHYS TRAILLI** Hutton.

*Trachichthys trailli* Hutt., T.N.Z. Inst., viii, 1876, p. 212; Günth., Chall. Rep xxii, 1887, p. 23, pl. lv., fig. A.

*Trachichthys macleayi* Johnston, P.R.S., Tasm., 1881, p. 56.

*Paratrachichthys trailli* Waite, Mem. Austr. Mus., iv, 1890, p. 65.

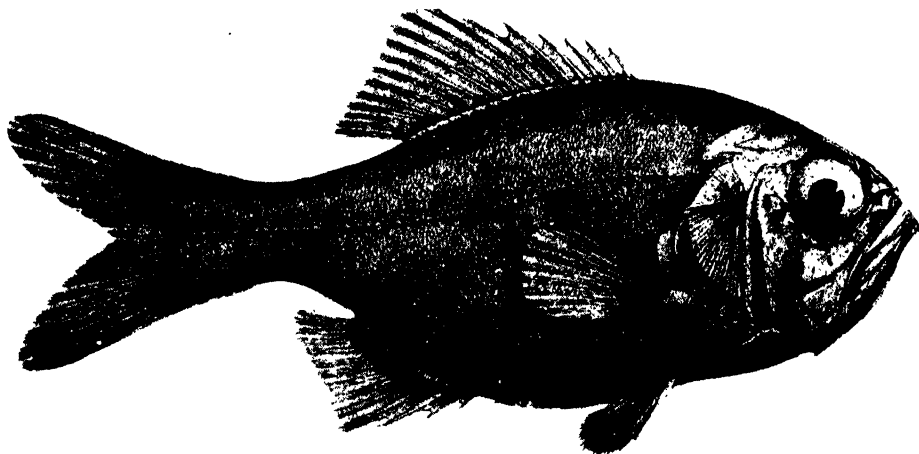


Fig. 111. *Paratrachichthys trailli*.

**TRACHICHTHYS** Shaw & Nodder, 1799 (australis).

**TRACHICHTHYS AUSTRALIS** Shaw & Nodder (Roughy).

*Trachichthys australis* Shaw & Nodder, Nat. Misc., x, 1799, pl. ccclxxviii; McCoy, Prod. Zool. Viet., dec. xii, 1886, pl. cxiv.

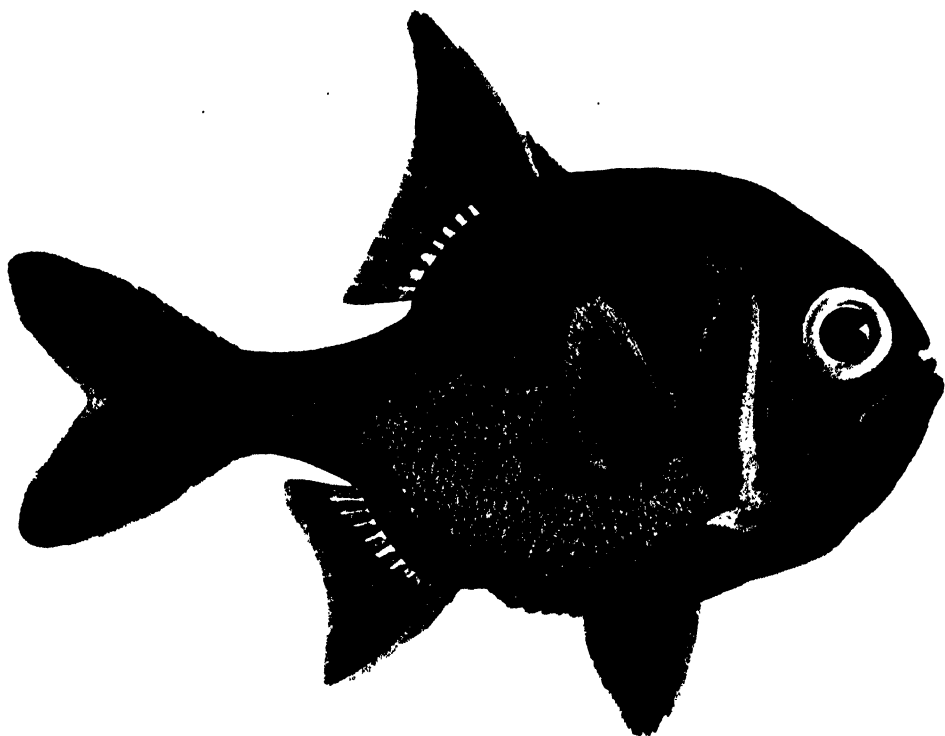


Fig. 112. *Trachichthys australis*.

#### FAMILY ZEIDAE.

**ZEUS** Linnaeus, 1758 (faber).

**ZEUS FABER** Linnaeus (John Dory).

*Zeus faber* Linn., Syst. Nat. (ed. x), 1758, p. 267; Day, Fish. Gt. Brit. and Irel., i, 1881, p. 138, pl. xlvi; Roughley, Fish. Aust., 1916, p. 168, pl. lviii.  
*Zeus australis* Rich., Zool. Ereb. & Terr., 1845, p. 36, pl. xxv., fig. 1.

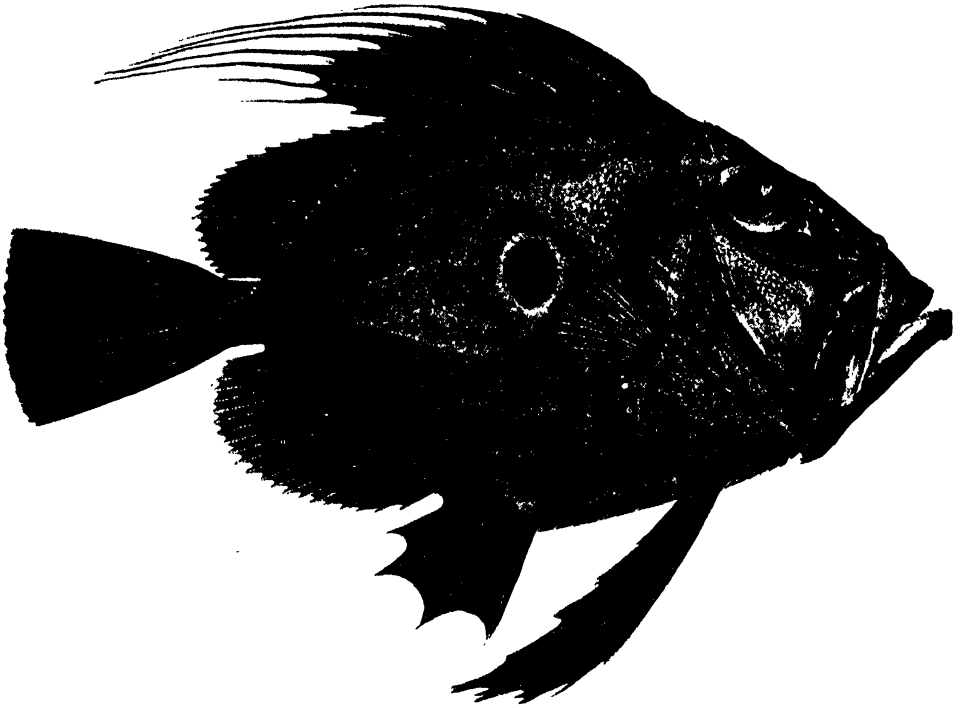


Fig. 113. *Zeus faber*.

A most excellent table fish, seldom seen in the Adelaide market, owing to entire absence of the trawling industry.

#### FAMILY CYTTIDAE.

**CYTTUS** Günther, 1860 (*australis*).

**CYTTUS AUSTRALIS** Richardson (Silver Dory).

*Capros australis* Rich., T.Z.S., iii, 1849, p. 73 and Zool. Ereb. & Terr., 1848, p. 137, pl. lix, fig. 1-5.

*Cyttus australis* Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 396; Stead, Edib. Fish. N.S.W., 1908, p. 102, pl. lxviii.

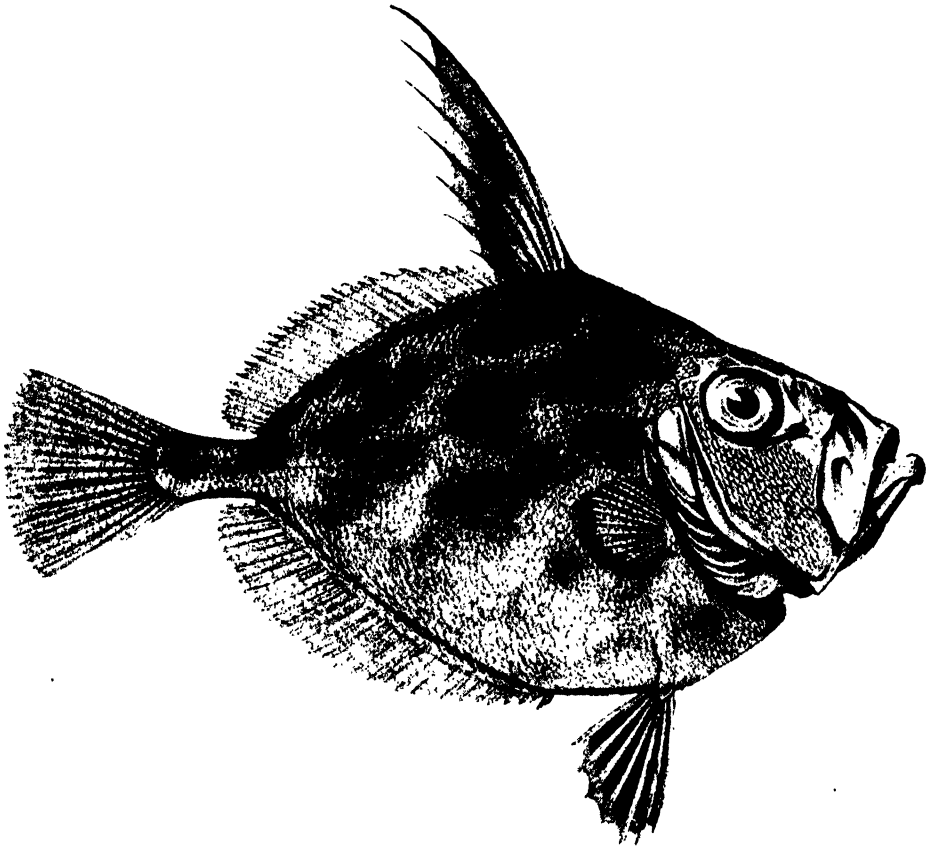


Fig. 114. *Cyttus australis*.

Another good fish which will doubtless be better known w n our waters are properly fished.

**CYTTOSOMA** Gilchrist, 1904 (boops).

**CYTTOSOMA BOOPS** Gilchrist (Ox-eyed Dory).

*Cyttosoma boops* Gilch., Mar. Invest. S. Afric., iii, 1904, p. 6, pl. xxiii; McCull., Endeavour Res., ii, 1914, p. 113.

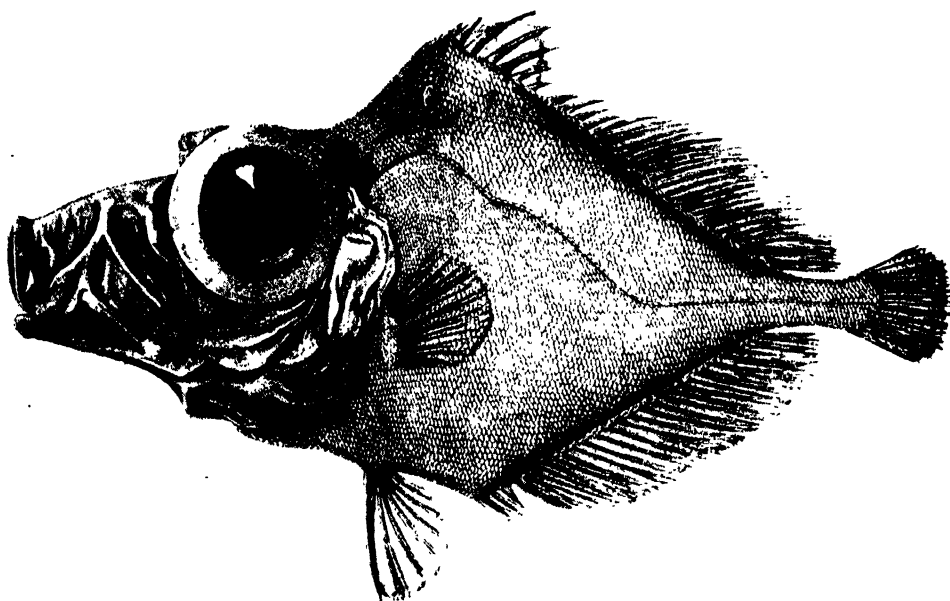


Fig. 115. *Cyttosoma boops*.

Likewise awaiting the advent of the trawl. Specimens were taken by the "Simplon" in 1914, in 80-140 fathoms, and previously by the "Endeavour" in still deeper water, all obtained in the Great Australian Bight.

**NEOCYTTUS** Gilchrist, 1907 (*rhomboidalis*).

**NEOCYTTUS RHOMBOIDALIS** Gilchrist.

*Neocyttus rhomboidalis* Gilch., Mar. Invest. S. Afric., iv, 1907, p. 153, pl. xlii.

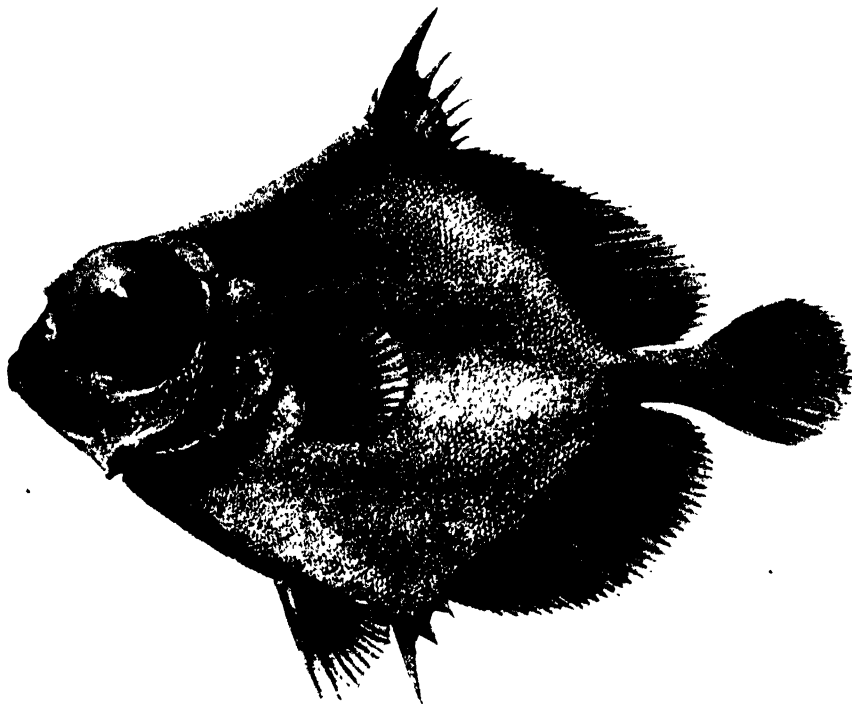


Fig. 116. *Neocyttus rhomboidalis*.

South Australian specimens are referred to a variety, as below.

**var. GIBBOSUS McCulloch.**

*Neocyttus rhomboidalis* var. *gibbosus* McCull., Endeavour Res., ii, 1914, p. 119, fig. 8.

Typical forms of this and the following species were first described from South Africa. Australian representatives were secured in the Great Australian Bight by the "Endeavour" in 350-450 fathoms.

**ALLOCYTTUS McCulloch, 1914 (verrucosus).**

**ALLOCYTTUS VERRUCOSUS Gilchrist.**

*Oreosoma* sp. Boul., Compt. Rendu, Acad. Sci. Paris, cxxxvii, 1903, p. 523.

*Cyttosoma verrucosum* Gilch., Mar. Invest. S. Afric., iv. 1908, p. 151, pl. xl.

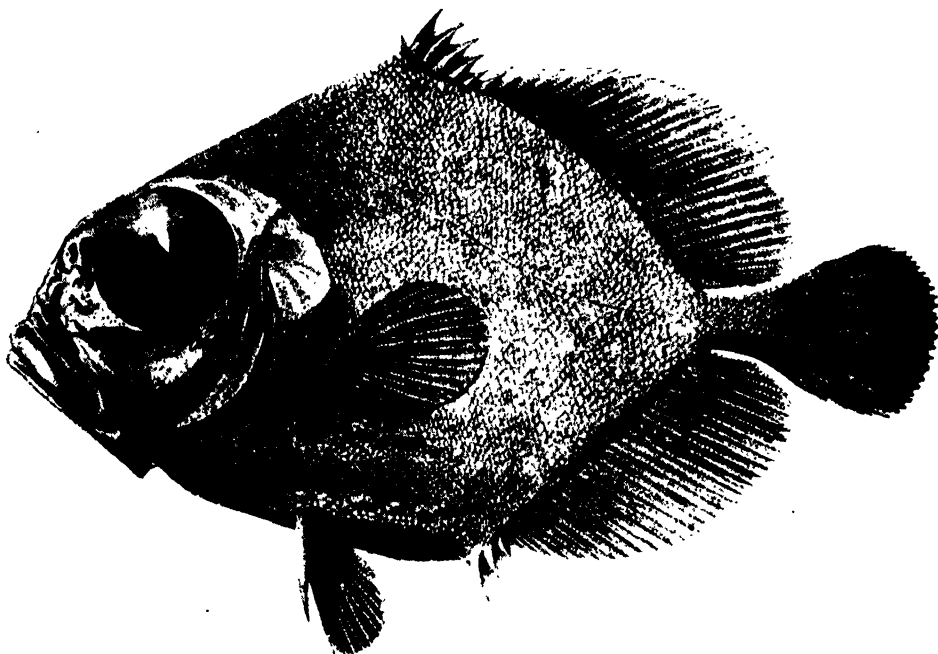


Fig. 117. *Allocyttus verrucosus*.

South Australian specimens are referred to a variety, as below.

**var. PROPINQUUS McCulloch.**

*Allocyttus verrucosus* var. *propinquus* McCull., Endeavour Res., ii, 1914, p. 116, fig. 7.

## **ORDER PERCOMORPHI.**

### **SUB-ORDER PERCESOCES.**

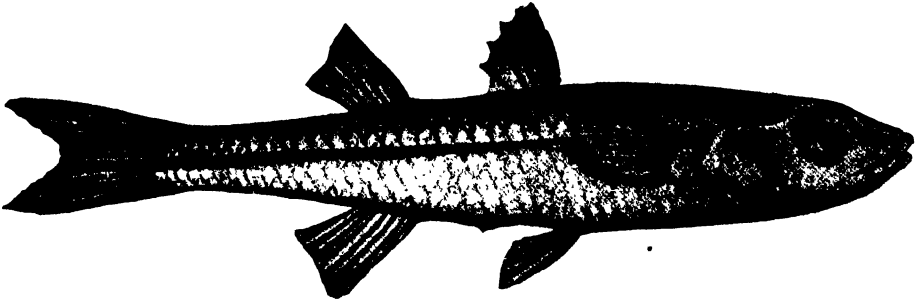
#### **FAMILY ATHERINIDAE.**

**CRATEROCEPHALUS McCulloch, 1912** (*fluviatilis*).

**CRATEROCEPHALUS FLUVIATILIS McCulloch** (Fresh-water Hardyhead, Parli).

*Craterocephalus fluviatilis* McCull., P.R.S., Qld., xxiv., 1912, p. 49, pl. i, fig. 1.



Fig. 118. *Craterocephalus fluvialtilis*.

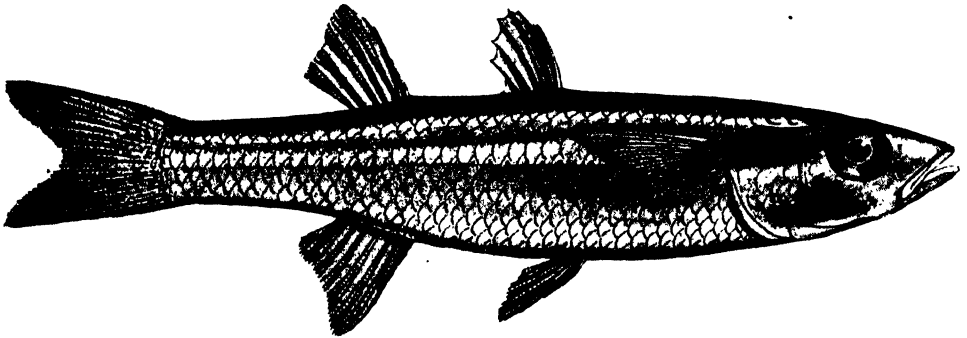
The members of this Family are small fishes of no commercial value.

**CRATEROCEPHALUS EYRESII Steindachner.**

*Atherinichthys eyresii* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 194 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1075.

*Atherina interioris* Zietz, T.R.S., S.A., xxxiii, 1909, p. 264 (*nom. nud.*).

*Craterocephalus eyresii* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 43, fig. 27.

Fig. 119. *Craterocephalus eyresii*.

**ATHERINA Linnaeus, 1758 (hepsetus).**

**ATHERINA TAMARENSIS Johnston.**

*Atherina tamarensis* Johnston, P.R.S., Tasm., 1883, p. 122.

*Atherina tasmaniensis* MacL., P.L.S., N.S.W., ix, 1884, p. 443.

*Atherinichthys cephalotes* Zietz, T.R.S., S.A., xxxiii, 1909, p. 264 (not Cast.).

*Taeniomembras tamarensis* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 41.

**ATHERINA DANNEVIGI McCulloch.**

*Atherina hepsetus* Günth., A.M.N.H. (4), xvii, 1876, p. 396 (not Linn.).

*Atherina dannevigii* McCull., Endeavour Res., i, 1911, p. 31, pl. xvi, fig. 2.

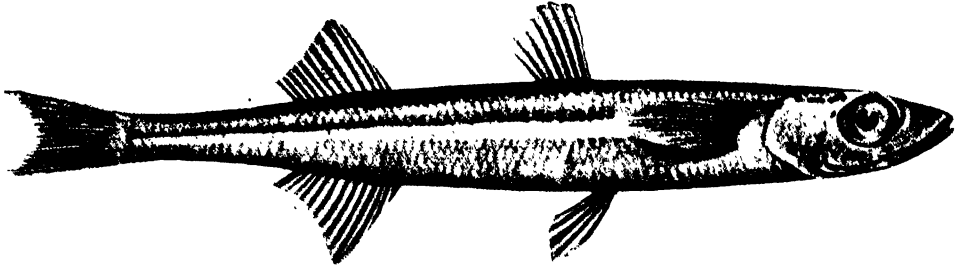


Fig. 121. *Atherina dunneryi*.

**HEPSETIA** Bonaparte, 1837 (*boyeri*).

**HEPSETIA PINGUIS** Lacepède (Hardyhead).

*Atherina pinguis* Lacep., Hist. Nat. Poiss., v, 1803, p. 371, pl. xi, fig. 1; Ogil., Mem. Qld. Mus., i, 1912, p. 38, pl. xii, fig. 1.

*Atherinichthys modesta*, *A. pieta* and *A. cephalotes* Cast., P.Z.S., Viet., i, 1872, p. 136, 137.

*Atherina lacunosa* Günth., Journ. Mus. Godeff., xiii, 1877, p. 213, pl. cxviii, fig. E (not Forst.).

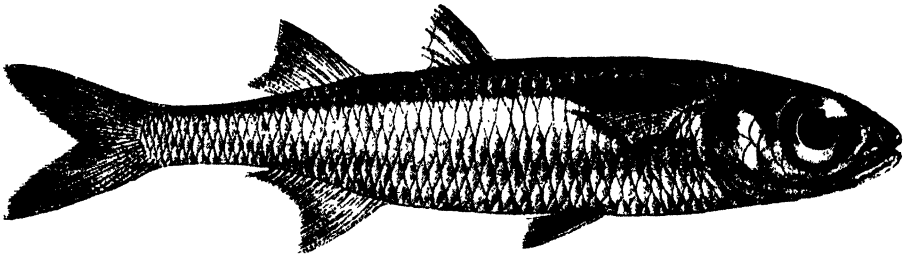


Fig. 122. *Hepsetia pinguis*.

## FAMILY MELANOTAENIIDAE.

**MELANOTAENIA** Gill, 1862 (*nigrans*).

**MELANOTAENIA NIGRANS** Richardson (Pink ear).

*Atherina nigrans* Rich., A.M.N.H., xi, 1843, p. 180.

*Melanotaenia nigrans* Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 280.

*Nematocentris splendida* Peters, Monatsb. Akad. Wiss. Berlin, 1866, p. 516.

*Strabo nigrofasciatus* Kner & Steind., Sitzb. Akad. Wiss. Wien, liv, 1866, p. 373, 395, pl. iii, fig. 10.

*Zantecla pusilla* Cast., P.Z.S., Viet., ii, 1873, p. 88.

*Aida inornata* Cast., Res. Fish. Aust., 1875, p. 10.

*Neoatherina australis* Cast., Res. Fish. Aust., 1875, p. 32.

*Aristeus fitzroyensis*, *A. fluvialis* and *Atherinichthys duboulayi* Cast., P.L.S., N.S.W., iii, 1878, p. 141, 143.

*Aristeus rufescens* and *A. lineatus* MacL., P.L.S., N.S.W., v, 1881, p. 625.

*Aristeus cavifrons* MacL., *op. cit.* vii, 1882, p. 70.

*Aristeus perporosus* De Vis, P.L.S., N.S.W., ix, 1884, p. 694.

*Aristeus loriae* Perugia, Ann. Mus. Genova (2), xiv, 1894, p. 549.

*Nematocentris tatei* and *N. winneckei* Zietz, Rep. Horn Exped., ii, 1896, p. 178, 179, pl. xvi, fig. 2, 3.

*Melanotaenia maculata* Weber, Nova Guinea, v, 1908, p. 239, pl. xi, fig. 4.

*Melanotaenia ogilbyi* Weber, Notes Leyden Mus., xxxii, 1910, p. 230.

*Rhombatractus patoti* Weber, Abh. Senckenb. Nat. Ges., xxxiv, 1911, p. 26, pl. i, fig. 3.

*Melanotaenia maccullochi* Ogil., Mem. Qld. Mus., iii, 1915, p. 118, pl. xxix, fig. 1.

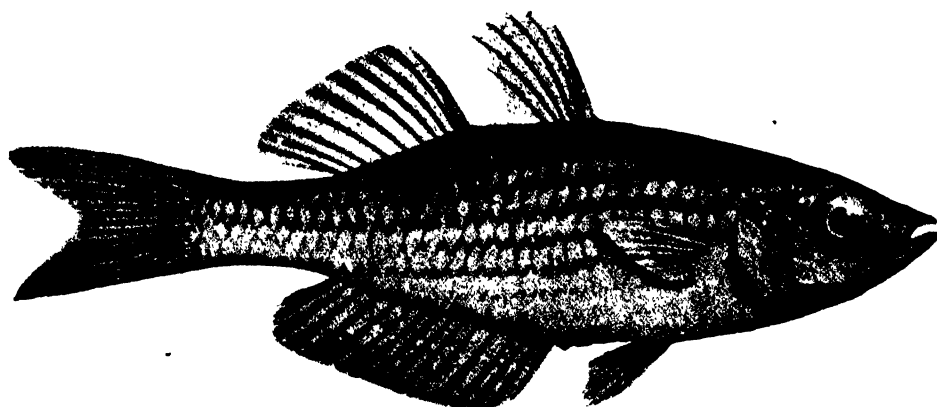


Fig. 123. *Melanotaenia nigrans*.

A small fresh-water fish, admirably suited for the aquarium.

## FAMILY MUGILIDAE.

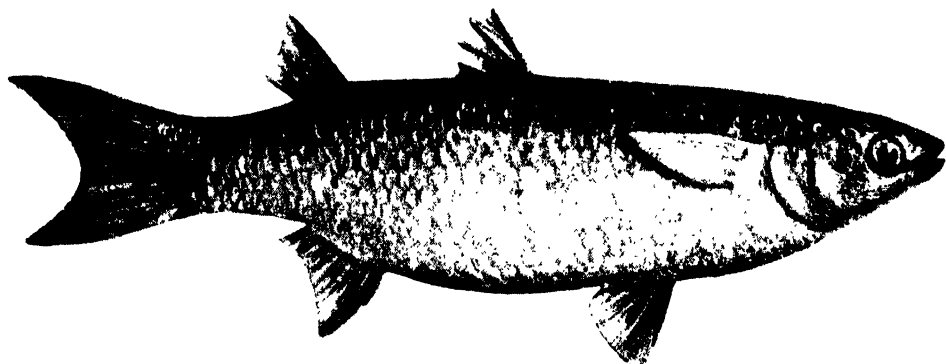
**MUGIL** Linnaeus, 1858 (cephalus).

**MUGIL ARGENTEUS** Quoy & Gaimard (Jumping Mullet, Wankari).

*Mugil argenteus* Quoy & Gaim., Voy. Uran. & Physic., Poiss., 1825, p. 338, pl. lix, fig. 3.

*Mugil peronii* Cuv. & Val., Hist. Nat. Poiss., xi, 1836, p. 138; Ogil., Edib. Fish. N.S.W., 1893, p. 126; pl. xxxii; Stead, Edib. Fish. N.S.W., 1908, p. 42, pl. xiii; Roughley, Fish. Aust., 1916, p. 41, pl. viii.

*Mugil ferrandi* Cuv. & Val., *op. cit.*, p. 142.

Fig. 124. *Mugil argentatus*.

The Flat-tailed Mullet of the eastern States, plentiful and good-eating, but not so esteemed as the next species.

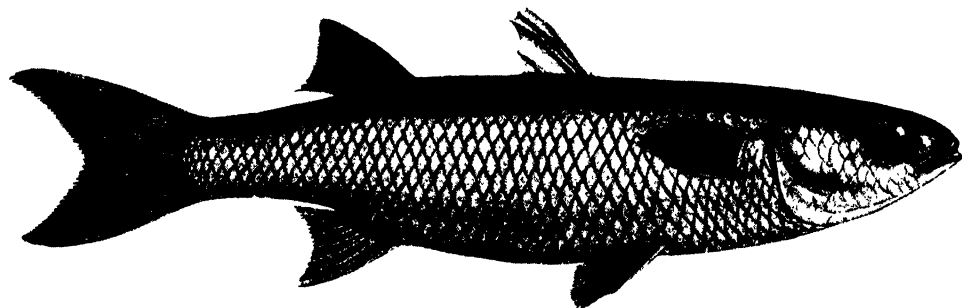
**MUGIL DOBULA** Günther (Sea Mullet).

*Mugil dobula* Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 420, fig. (head) and Fische Südsee, ii, 1877, p. 214, pl. cxx, fig. A (head); Ogil., Edib. Fish. N.S.W., 1893, p. 118, pl. xxxi; Stead, Edib. Fish. N.S.W., 1908, p. 40, pl. xii; Roughley, Fish. Aust., 1916, p. 37, pl. vii.

*Mugil waigiensis* Cast., P.Z.S., Viet., i, 1872, p. 140 (not Quoy & Gaim.).

*Mugil grandis* Cast., P.L.S., N.S.W., iii, 1879, p. 386.

*Mugil cephalotus* Johnston, P.R.S., Tasm., 1883, p. 122 (not Cuv. & Val.).

Fig. 125. *Mugil dobula*.

One of the most important food fishes of the Commonwealth, plentiful throughout the year.

**AGONOSTOMUS** Bennett, 1830 (telfari).

**AGONOSTOMUS FORSTERI** Bloch & Schneider (Fresh-water Mullet, Conmuri).

*Albula forsteri* Bl. & Schn., Syst. Ichth. 1801, p. xxxii and 120.

*Dajaus diemensis* Rich., P.Z.S., 1840, p. 25 and Zool. Ereb. & Terr., 1845, p. 37, pl. xxvi, fig. 1, 2.

*Dajaus forsteri* Rich., Zool. Ereb. & Terr. 1847, p. 77, pl. xlv, fig. 20-26 (young).

*Agonostoma forsteri* Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 465.

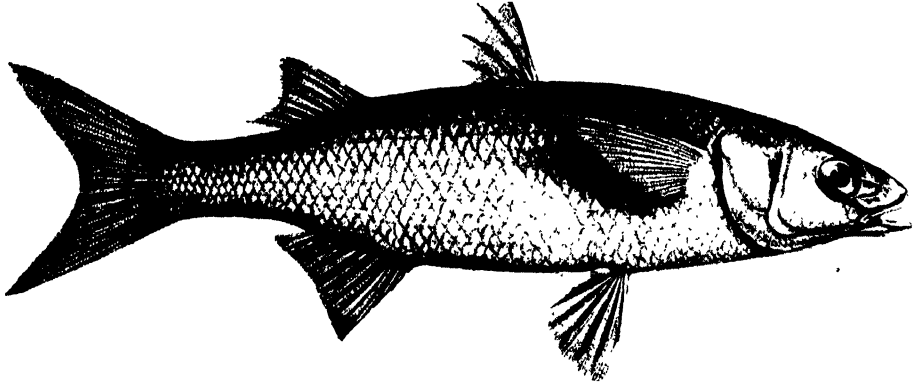


Fig. 126. *Agonostomus forsteri*.

Widely distributed, but of small economic value.

**MYXUS** Günther, 1861 (elongatus).

**MYXUS ELONGATUS** Günther (Sand Mullet).

*Myxus elongatus* Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 466; Ogil., Edib. Fish. N.S.W., 1893, p. 128, pl. xxxiii; Waite, Prelim. Rep. Thetis, 1898, p. 61, pl. xii; Stead, Edib. Fish. N.S.W., 1908, p. 45, pl. xiv; Roughley, Fish. Aust., 1916, p. 43, pl. ix.

*Cestracus norfolcensis* Ogil., P.L.S., N.S.W., xxii, 1898, p. 80.

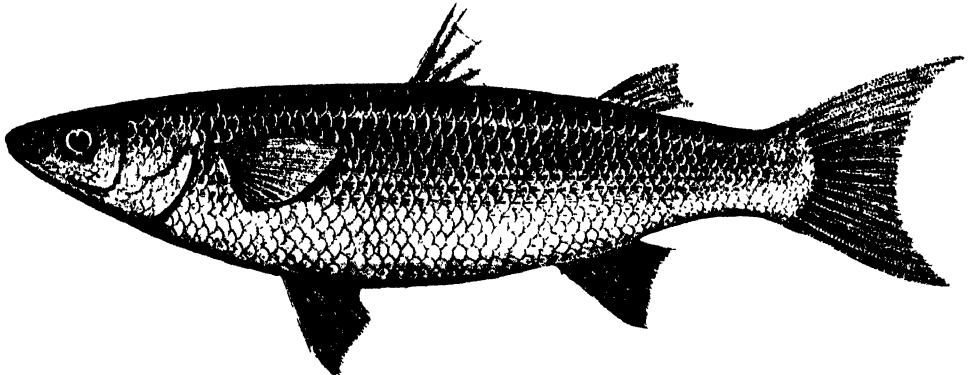


Fig. 127. *Myxus elongatus*.

Though commonly taken and eaten, it is not to be compared with the fish known as Sea Mullet.

### FAMILY SPHYRAENIDAE.

**SPHYRAENA** Rose, 1793 (sphyraena).

**SPHYRAENA NOVAE-HOLLANDIAE** Günther (Snook, Short-finned Pike).

*Sphyraena novae-hollandiae* Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 335; Ogil., Edib. Fish. N.S.W., 1893, pl. xxx (description, p. 114, is of *S. waitii* Ogil.); Roughley, Fish. Aust., 1916, p. 45.



Fig. 128. *Sphyraena novae-hollandiae*.

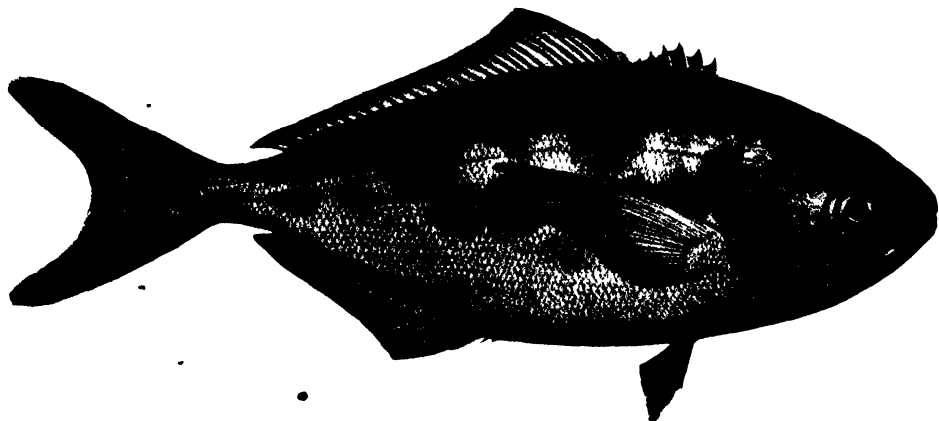
An excellent table fish, and affords good sport by trailing a lure after a sailing boat. It attains to 3 feet in length.

**SPHYRAENA OBTUSATA** Cuvier & Valenciennes (Pike).

*Sphyraena obtusata* Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 350; Günth., Fische Südsee, ii, 1877, p. 212, pl. exix, fig. B.  
*Sphyraena flavicauda* Rupp., Neue Wirbelt., Fisch., 1835, p. 100, pl. xxv, fig. 3.

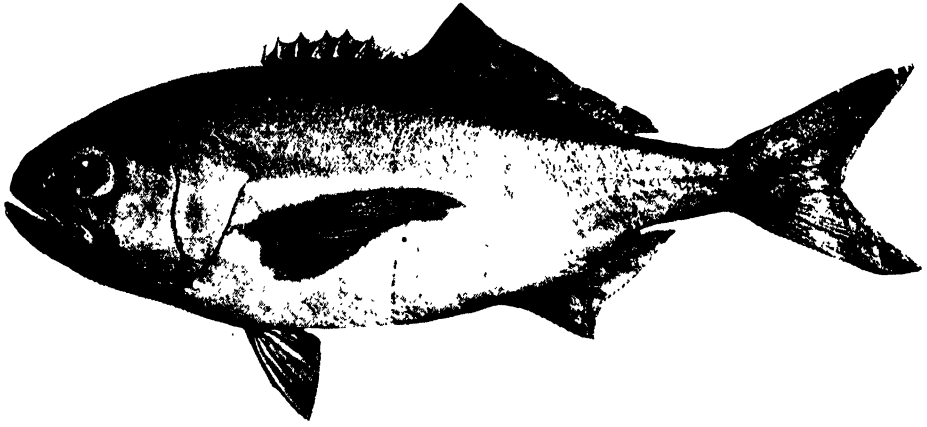


Fig. 129. *Sphyraena obtusata*.

**SUB-ORDER STROMATEOIDEA.****FAMILY STROMATEIDAE.****SERIOLELLA** Guichenot, 1848 (*porosa*).**SERIOLELLA BRAMA** Günther (*Sea Bream*).*Neptomenus brama* Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 390.*Neptonemus? travale* Cast, P.Z.S., Viet., i, 1872, p. 119.*Seriolella brama* Regan, A.M.N.H. (7), x, 1902, p. 129; Waite, Rec. Cant. Mus., i, 1911, p. 229, pl. 1; McCull., Endeavour Res., i, 1911, p. 34, pl. ix, fig. 1.Fig. 130. *Seriolella brama*.

The Warehouse of New Zealand, where it is fairly common and esteemed as food.

**HYPEROGLYPHE** Günther, 1859 (*porosa*).**HYPEROGLYPHE POROSA** Richardson (*Deep-sea Trevally*).*Diagramma porosa* Rich., Zool. Ereb. & Terr., 1845, p. 26, pl. xvi., fig. 5, 6.*Hyperoglyphe porosa* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 337.*Eurumetopos johnstonii* Morton, P.R.S., Tasm., 1888, p. 77 and plate; Waite, T.N.Z. Inst., xlv, 1912, p. 200, pl. xii.*Schedophilus porosus* Waite, Mem. N.S.W. Nat. Club, 1904, p. 24.*Hyperoglyphe johnstonii* McCull., Endeavour Res., ii, 1914, p. 95, pl. xviii.

Fig. 131. *Hyperoglyphe porosa*.

A large and excellent fish of erratic occurrence. Large quantities have at times been taken at the Chatham Islands.

## SUB-ORDER PERCOIDEA.

### DIVISION PERCIFORMES.

#### FAMILY SERRANIDAE.

#### **PERCALATES** Ramsay & Ogilby, 1887 (colonorum).

#### **PERCALATES COLONORUM** Günther (Australian Perch, Taralgi).

*Lates colonorum* Günth., A.M.N.H. (3), xi, 1863, p. 114; McCoy, Prod. Zool. Viet., dec. ii, 1878, pl. xiv.

*Dules novem-aculeatus* Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 428, pl. ii, fig. 1.

*Lates similis*, *L. antarcticus*, and *L. victoriae* Cast., P.Z.S., Viet., i, 1872, p. 44, 45.

*Lates curtus* Cast., Res. Fish. Aust., 1875, p. 5.

*Lates ramsayi* MacL., P.L.S., N.S.W., v, 1881, p. 306.

*Percalates colonorum* Rams. & Ogil., P.L.S., N.S.W. (2), ii, 1887, p. 182; Ogil., Edib. Fish. N.S.W., 1893, p. 2, pl. i; Stead, Edib. Fish. N.S.W., 1908, p. 53, pl. xx.



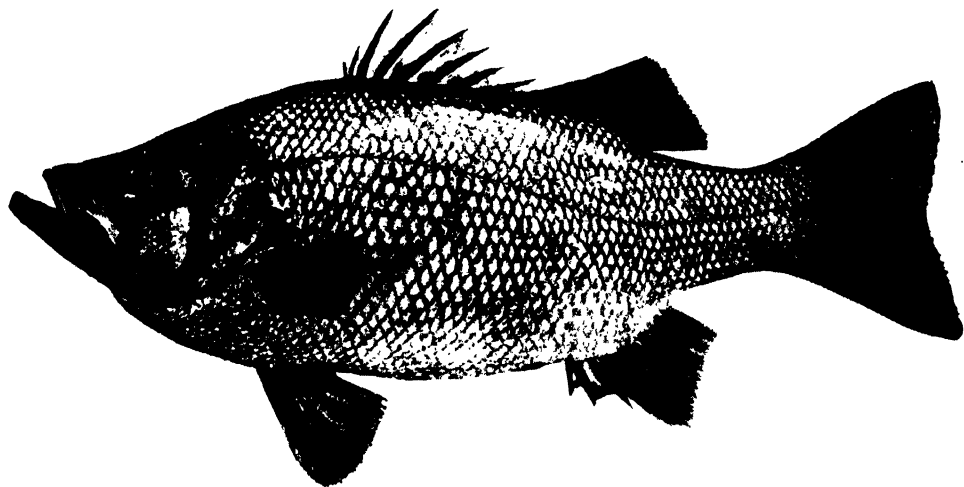


Fig. 132. *Percalates colonorum*.

A good table fish and a favourite with river anglers.

**PLECTROPLITES Gill, 1862 (ambiguous).**

**PLECTROPLITES AMBIGUUS Richardson (Callop, Tarki).**

*Dalnia? ambigua* Rich., Zool. Erch. & Terr., 1845, p. 25, pl. xix.

*Dofes ambiguus* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 270; Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 348.

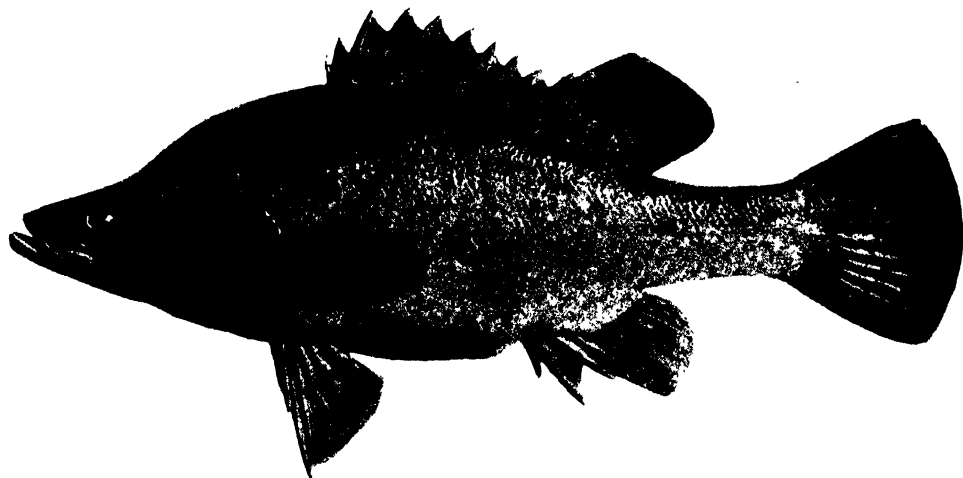


Fig. 133. *Plectroplites ambiguus*.

*Plectroplites ambiguus* Gill, Proc. Acad. Nat. Sci. Phil., 1863, p. 286; Stead, Edib. Fish. N.S.W., 1908, p. 55, pl. xxiii; Roughley, Fish. Aust., 1916, p. 67, pl. xvii.

*Ctenolates macquariensis* Günth., P.Z.S., 1871, p. 320, pl. xxxiii.

*Dules auratus* Cast., P.Z.S., Viet., i, 1872, p. 55.

*Dules flavescens* Cast., Res. Fish. Aust., 1875, p. 10.

*Ctenolates ambiguus* Günth., Chall. Rep., i, 1880, p. 32; McCoy, Prod. Zool. Viet., dec. ix, 1884, pl. lxxxiv; Ogil. Edib. Fish. N.S.W., 1893, p. 22, pl. v.

Also known as Murray Perch and Golden Perch. Second only to the Murray Cod as a river fish; by some preferred on account of the less oily nature of the flesh; also esteemed when smoked.

**MACQUARIA Cuvier & Valenciennes, 1830 (australasica).**

**MACQUARIA AUSTRALASICA Cuvier & Valenciennes (Macquarie Perch).**

*Macquaria australasica* Cuv. & Val., Hist. Nat. Poiss., v, 1830, p. 377, pl. cxxxi; Less. & Garn., Voy. Coquille, ii, 1830, p. 194, pl. xiv, fig. 1; Ogil., Edib. Fish. N.S.W., 1893, p. 24, pl. iv.

*Dules viverrinus* Krefft, P.Z.S., 1867, p. 943.

*Murrayia güntheri*, *M. cyprinoides*, and *M. bramoides* Cast., P.Z.S., Viet., i, 1872, p. 61, 62, 63.

*Riverina fluviatilis* Cast., *op. cit.*, p. 64.

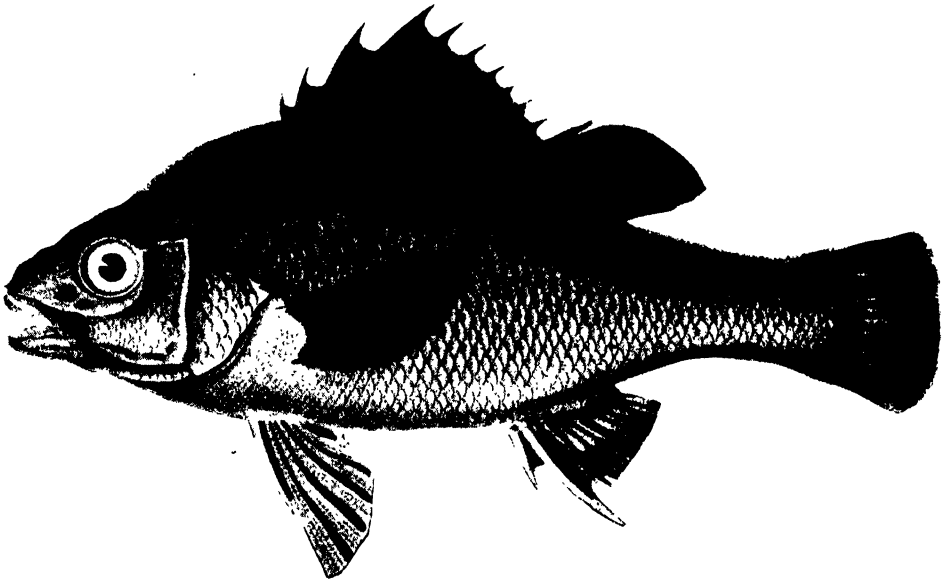


Fig. 134. *Macquaria australasica*.

An excellent table fish, but as with many of our River Murray fish, catches are sent to Melbourne rather than to Adelaide.

**OLIGORUS** Günther, 1859 (*macquariensis*).

**OLIGORUS MACQUARIENSIS** Cuvier & Valenciennes (Murray Cod, Pondi).

*Grystes macquariensis* Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 58; Guérin, Icon. Règ. Anim. Poiss., 1844, pl. v, fig. 2; Rich., Zool. Ereb. & Terr., 1848, p. 118, pl. liii.

*Grystes brisbanii* Less., Voy. Coquille, Zool. ii, 1831, p. 227.

*Gristes peelii* Mitch., Exp. Aust., i, 1838, p. 95, pl. v, fig. 1.

*Oligorus macquariensis* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 251; McCoy, Prod. Zool. Viet., dec. ix, 1884, pl. lxxxv, lxxxvi; Ogil., Edib. Fish. N.S.W., 1893, p. 17, pl. viii; Stead, Edib. Fish. N.S.W., 1908, p. 56, pl. xxiv; Roughley, Fish. Aust., 1916, p. 62, pl. xvi.

*Oligorus mitchellii* Cast., P.Z.S., Viet., ii, 1873, p. 150.

*Homodemus cavifrons* De Vis, P.L.S., N.S.W., ix, 1884, p. 396.

*Oligorus gibbiceps* MacL., P.L.S., N.S.W., x, 1885, p. 267.

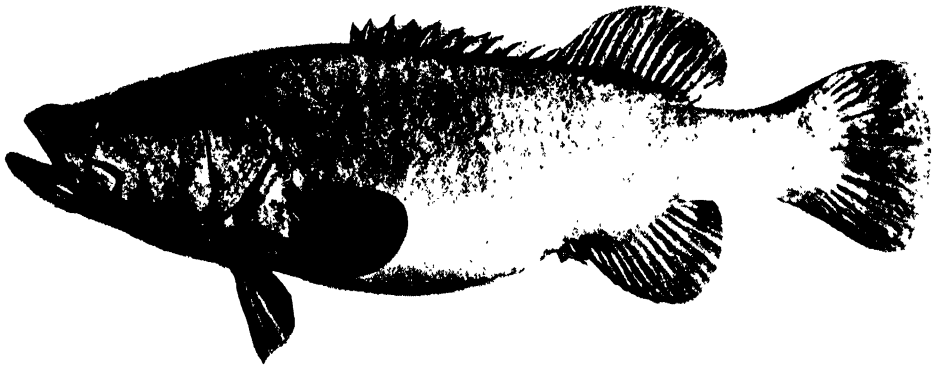


Fig. 135. *Oligorus macquariensis*.

The largest and most esteemed fresh-water fish: is smoked and cured in various ways. Attains to a length of nearly 5 feet and a weight of 100 lb.

**COLPOGNATHUS** Klunzinger, 1880 (*dentex*).

**COLPOGNATHUS DENTEX** Cuvier & Valenciennes (Harlequin Fish).

*Plectropoma denter* Cuv. & Val., Hist. Nat. Poiss., ii, 1828, p. 394; Quoy & Gaim., Voy. Astrol., 1835, p. 660, pl. iv, fig. 2; Rich., Zool. Ereb. & Terr., 1848, p. 117, pl. lvii, fig. 3-5.

*Plectropoma richardsonii* Günth., P.Z.S., 1861, p. 391, pl. xxxviii.

*Colpognathus denter* Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 339, pl. i, fig. 1 (head); Boul., Cat. Fish. Brit. Mus. (2), i, 1895, p. 310, fig. 21 (dentition).

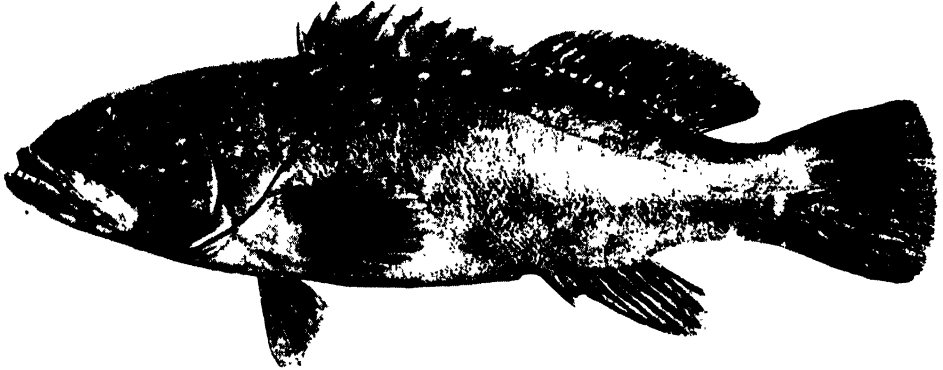


Fig. 136. *Colpognathus denter*.

A good eating fish, but seldom seen in the markets. Of gorgeous colouration: scarlet, with blue spots and yellow markings.

**CALLANTHIAS** Lowe, 1839 (*paradisaeus*).

**CALLANTHIAS ALLPORTI** Günther (Allport's Perch).

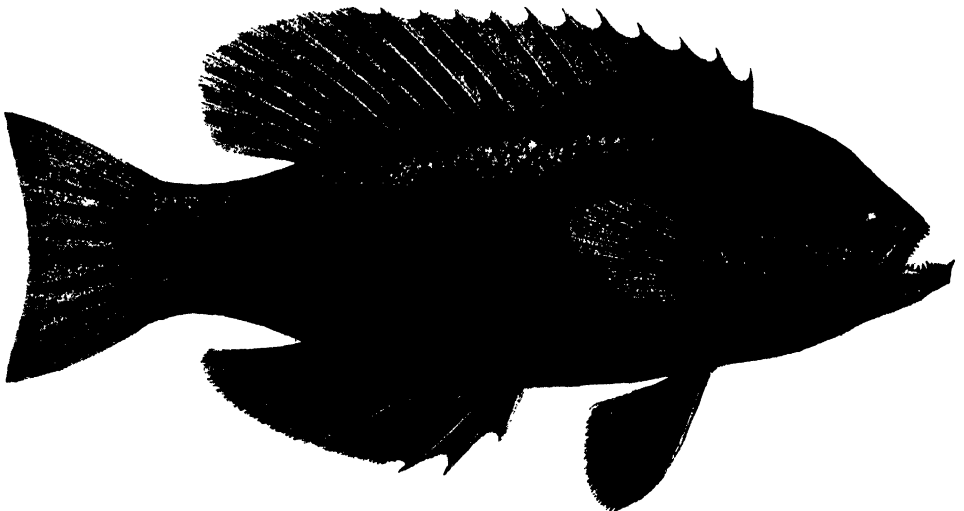


Fig. 137. *Callanthias allporti*.

*Callanthias allporti* Günth., A.M.N.H. (4), xvii, 1876, p. 390; Boul., Cat. Fish. Brit. Mus. (2), i, 1895, p. 335, pl. xv; Waite, Prelim. Rep. Thetis Exped., 1898, p. 31, pl. ii; McCull., Endeavour Rep., i, 1911, p. 51.

*Callanthias platei* Boul., A.M.N.H. (7), iii, 1899, p. 346; Waite, Mem. Aust. Mus., iv, 1899, p. 80.

*Callanthias platei australis* and *Anogramma allporti* Ogil., P.L.S., N.S.W., xxiv, 1899, p. 173, 175.

Not very common in Australian waters, but said to occur in large shoals off the west coast of America.

**CAESIOPERCA** Castelnau, 1872 (raser).

**CAESIOPERCA RASOR** Richardson (Red Perch).

*Serranus raser* Rich., P.Z.S., 1839, p. 95 and T.Z.S., iii, 1849, p. 73, pl. iv, fig. 1.

*Anthias raser* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 93.

*Caesioperca raser* Cast., P.Z.S., Viet., i, 1872, p. 49.

*Anthias extensus* Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 339, pl. ii.

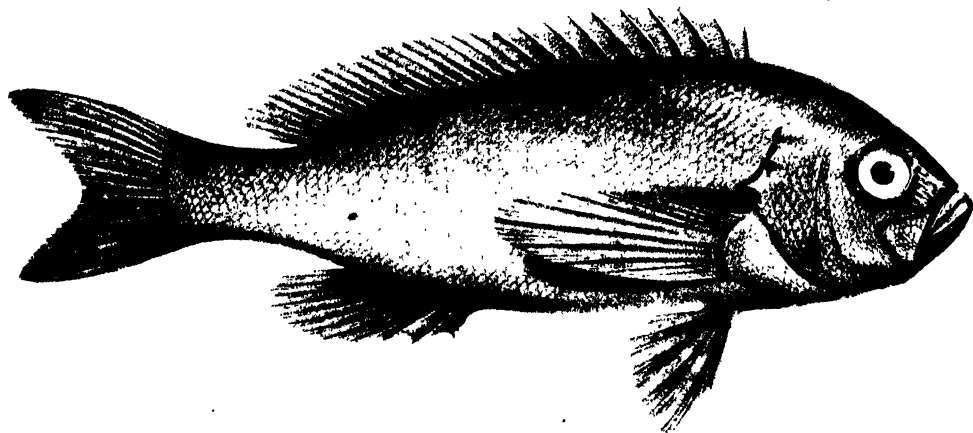


Fig. 138. *Caesioperca raser*.

Common in winter in Tasmania, where it is known as The Barber.

**CAESIOPERCA LEPIDOPTERA** Forster (Butterfly Perch).

*Epinephelus lepidopterus* Forst., in Bl. & Schn., Syst. Ichth., 1801, p. 302.

*Serranus lepidopterus* Rich., A.M.N.H., ix, 1842, p. 18.

*Percu lepidoptera* Forst., Descr. Anim., 1844, p. 138.

*Anthias richardsonii* Günth., P.Z.S., 1869, p. 429.

*Scorpius hectori* Hutt., Cat. Fish. N.Z., 1872, p. 4, pl. i, fig. 4.

*Pseudanthias lepidopterus* Gill., Mem. Acad. Wash., vi, 1894, p. 116.

*Cacsioperca lepidoptera* Boul., Cat. Fish. Brit. Mus. (2), i, 1895, p. 312;  
Roughley, Fish. Aust., 1916, p. 75, pl. xxi.

*Anthias lepidopterus* Waite, Prelim. Rep. Thetis Exped., 1898, p. 31, pl. i.

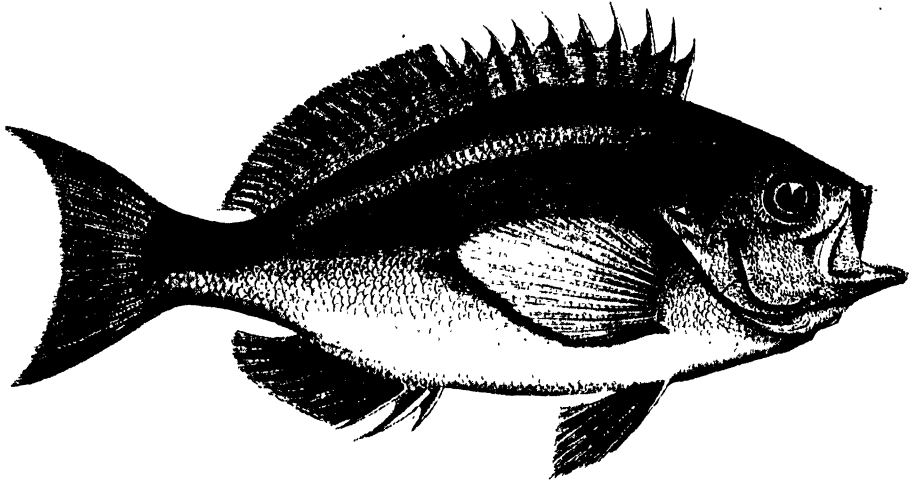


Fig. 139. *Cacsioperca lepidoptera*.

Commonly taken at moderate depths off New South Wales and Tasmania, where it is much esteemed. It was almost unknown until the advent of the trawl.

**HYPOPLECTRODES** Gill, 1862 (*nigroruber*).

**HYPOPLECTRODES NIGRORUBER** Cuvier & Valenciennes (*Black-banded Sea Perch*).

*Plectropoma nigrorubrum* Cuv. & Val., Hist. Nat. Poiss., ii, 1828, p. 402; Quoy & Gaim., Voy. Astrol., iii, 1835, p. 659, pl. iv, fig. 1; Ogil., Edib. Fish. N.S.W., 1893, p. 11.

*Hypoplectrodes nigroruber* Gill (Poey), Ann. Lyc. Nat. Hist. N. York, x, 1871, p. 45.

*Gilbertia nigrorubra* Boul., Cat. Fish. Brit. Mus. (2), i, 1895, p. 308.

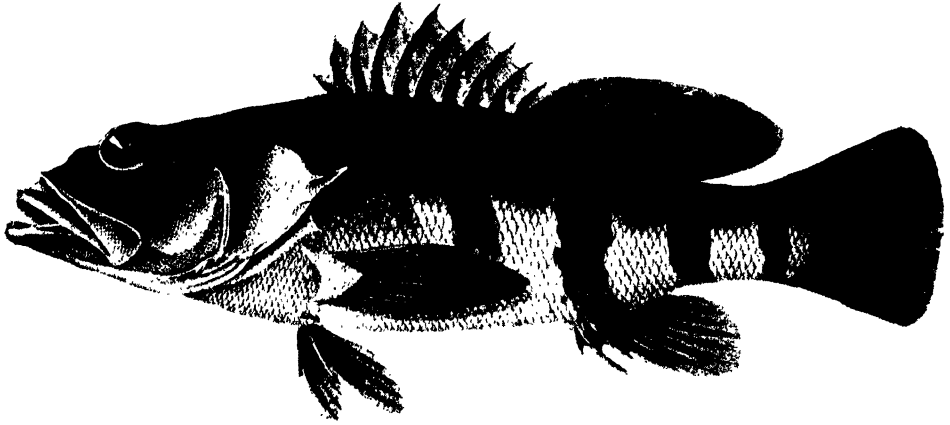


Fig. 140. *Hypoplectrodes nigroruber*.

Occurs from Eastern to Western Australia, and though much appreciated is not common.

#### FAMILY CENTRARCHIDAE.

**NANNOPERCA** Günther, 1861 (australis).

**NANNOPERCA AUSTRALIS** Günther (Pigmy Perch).

*Nannoperca australis* Günth., P.Z.S., 1861, p. 116, pl. xix, fig. 2; McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 46, pl. ii, fig. 1.

*Paradules lectus* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 21.

*Microperca garrac* Cast., P.Z.S., Vict., i, 1872, p. 48.

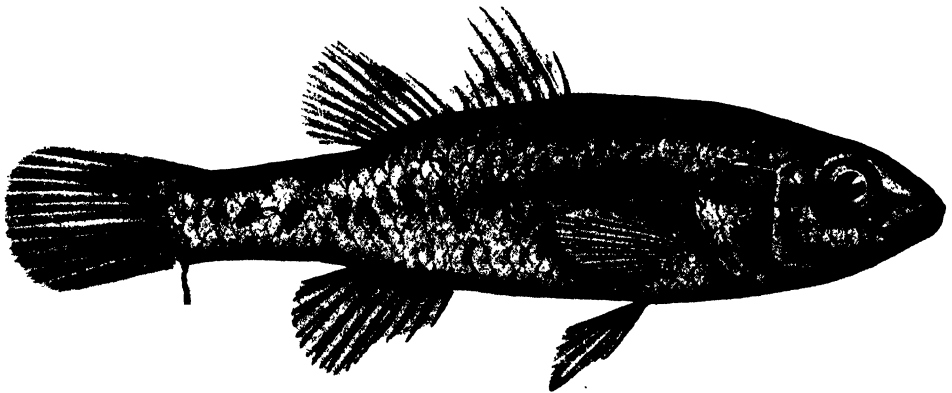


Fig. 141. *Nannoperca australis*.

?*Nannoperca riverinae* Mael., P.L.S., N.S.W., v, 1881, p. 342.

?*Microperca tasmaniae* Johnston, P.R.S., Tasm., 1883, p. 110.

*Micropoma* Zietz, T.R.S., S.A., xxvi, 1902, p. 265.

An excellent fresh-water aquarium fish.

## FAMILY THERAPONIDAE.

**THERAPON** Cuvier, 1817 (servus); (originally spelt Terapon).

**THERAPON PERCOIDES** Günther (Black-striped Perch).

*Therapon percoides* Günth., A.M.N.H. (3), xiv, 1864, p. 374; Zietz, Rep. Horn.

Exped., ii, 1896, p. 177, pl. xvi, fig. 1; Ogil. & McCull., Mem. Qld. Mus., v, 1916, p. 105, pl. x, fig. 1.

*Datnia fasciata* Steind., Sitzb. Akad. Wiss. Wien, lvi, 1867, p. 322.

*Therapon fasciatus* Cast., Res. Fish. Aust., 1875, p. 11.

*Therapon terrae-reginae* Cast., P.L.S., N.S.W., ii, 1878, p. 227.

*Therapon spinosior* De Vis, P.L.S., N.S.W., ix, 1884, p. 397.

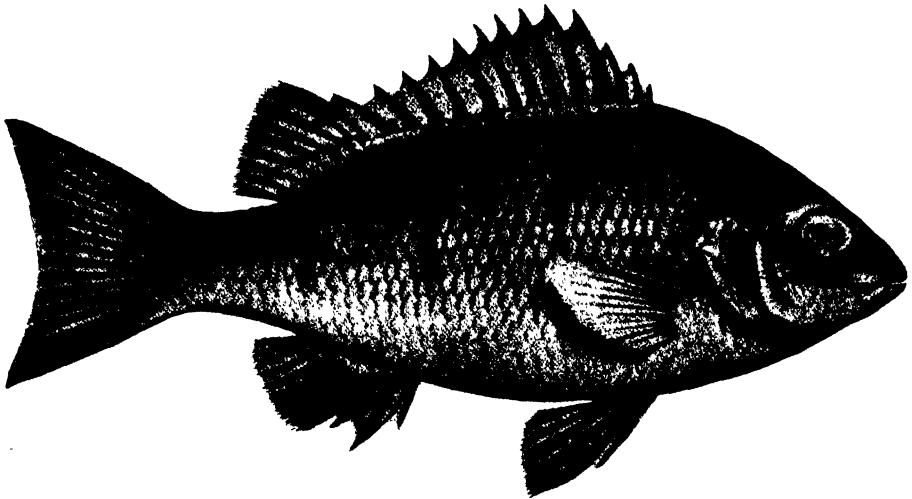


Fig. 142. *Therapon percoides*.

In Australia, the members of the genus *Therapon* are confined to fresh-water.

**THERAPON BIDYANA** Mitchell (Silver Perch, Teheri).

*Acerina (Cernua) bidyana* Mitch., Exped. Aust., i, 1838, p. 95, pl. viii.

*Datnia elliptica* Rich., Zool. Ereb. & Terr., 1848, p. 118, pl. lii, fig. 4-8.



*Therapon ellipticus* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 276; Ogil., Edib. Fish. N.S.W., 1893, p. 28, pl. vi; Stead. Fish. Aust., 1906, p. 123, pl. iv and Edib. Fish. N.S.W., 1908, p. 73, pl. xlii.

*Therapon niger* and *T. richardsoni* Cast., P.Z.S., Viet., i, 1872, p. 59, 60.

*Therapon macleayana* Rams., P.L.S., N.S.W., vi, 1882, p. 831.

*Therapon bidyana* McCull., Rec. Aust. Mus., ix, 1913, p. 359 and P.L.S., N.S.W., xl, 1915, p. 262, pl. xxxvi, fig. 1; Ogil. & McCull., Mem. Qld. Mus., v, 1916, p. 112.

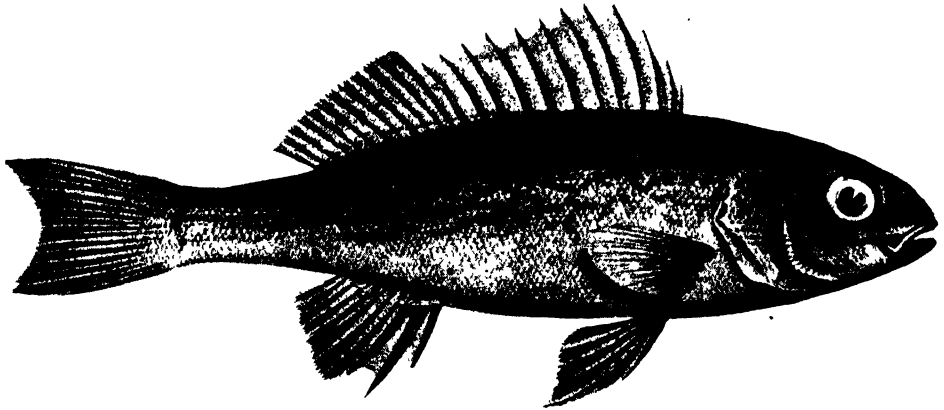


Fig. 143. *Therapon bidyana*.

A good sporting and food fish, common in the River Murray system.

#### **THERAPON UNICOLOR** Günther.

*Therapon unicolor* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 277; Ogil. & McC Mem. Qld. Mus., v, 1916, p. 109, pl. xi, fig. 1.

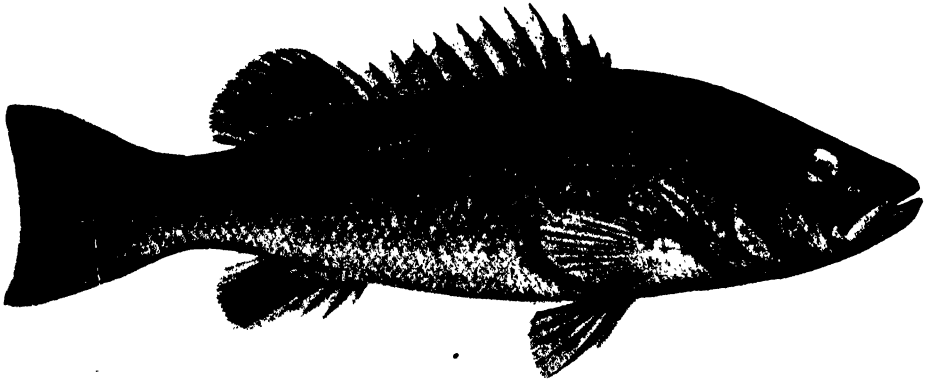


Fig. 144. *Therapon unicolor*.

?*Datnia brevispinis* Steind., Sitzb. Akad. Wiss. Wien, lvi, 1867, p. 309.

*Therapon truttaceus* and *T. longulus* MacL., P.L.S., N.S.W., v, 1881, p. 366, 367.

*Therapon elphinstonensis* De Vis, P.R.S., Qld., i, 1885, p. 57.

*Therapon idoneus* Ogil., P.R.S., Qld., xx, 1907, p. 37.

In common with *T. percoides* this species ranges into Central Australia, where it lies dormant in the mud during periods of drought.

### **THERAPON WELCHI McCulloch & Waite.**

*Therapon welchi* McCull. & Waite, T.R.S., S.A., xli, 1917, p. 472, fig. 1.

This and the following species are, so far, known only from Cooper Creek, in Central Australia.

### **THERAPON BARCOO McCulloch & Waite.**

*Therapon barcoo* McCull. & Waite, T.R.S., S.A., xli, 1917, p. 474, fig. 2.

### **HELOTES Cuvier, 1829 (sexlineatus).**

#### **HELOTES SEXLINEATUS Quoy & Gaimard (Striped Perch).**

*Therapon sexlineatus* Quoy & Gaim., Voy. Uranie & Physic., 1824, p. 340, pl. lx, fig. 1.

*Helotes sexlineatus* Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 149, pl. lvi; Valenci. in Cuv., Règ. Anim. III. Poiss., 1839, pl. xii, fig. 3; Bleek., Atl. Ichth., vii, 1876, p. 118, pl. cccxlii, fig. 5; Kner, Reise Novara, Fisch., 1865, p. 46, pl. iii, fig. 1.

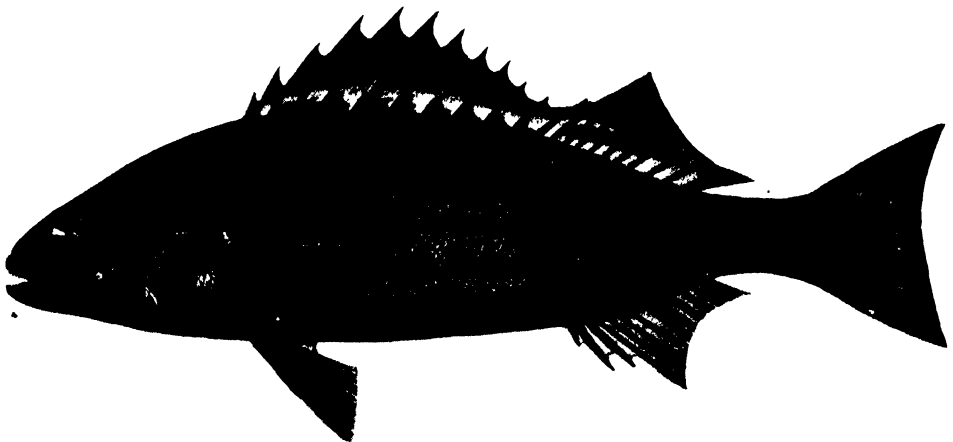


Fig. 147. *Helotes sexlineatus*.

?*Helotes profundior* De Vis, P.L.S., N.S.W., ix, 1884, p. 397.

?*Helotes scotus* Haacke, Zool. Anz., viii, 1885, p. 508.

Our only marine species of the Family.

## FAMILY PLESIOPIDAE.

**PARAPLESIOPS** Bleeker, 1875 (*bleekeri*).

**PARAPLESIOPS MELEAGRIS** Peters (Blue Devil).

*Plesiops meleagris* Peters, Mon. Akad. Wiss. Berlin, 1870, p. 708.

*Ruppellia prolongata* Cast., Res. Fish. Aust., 1875, p. 29 (not of 1873).

*Paraplesiops meleagris* Boul., Cat. Fish. Brit. Mus. (2) i, 1895, p. 339; McCull.,  
Rec. W.A. Mus., i, 1912, p. 84, pl. ix.

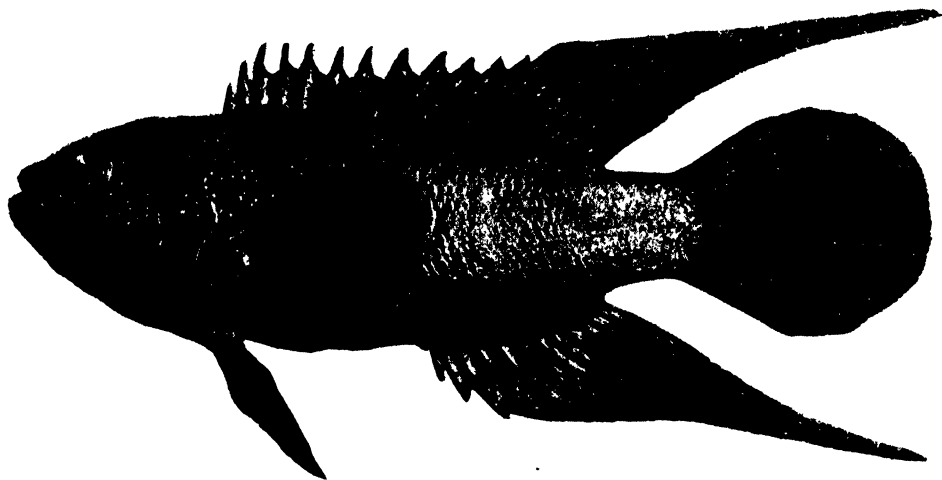


Fig. 148. *Paraplesiops meleagris*.

Of intense blue colour with pale blue spots.

**PARAPLESIOPS GIGAS** Steindachner.

*Plesiops gigas* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 196 and Sitzb., Akad.  
Wiss. Wien, lxxxviii, 1884, p. 1089.

*Paraplesiops gigas* Boul., Cat. Fish. Brit. Mus., i, 1895, p. 339.

FAMILY APOGONIDAE.

**APOGON** Lacepède, 1802 (*ruber*).

**APOGON CONSPERSUS** Klunzinger (Soldier Fish).

- Apogon conspersus* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 18 and Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 344, pl. iii, fig. 2; Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1066, pl. i, fig. 1.  
*Vincentia waterhousii* Cast., P.Z.S., Viet., i, 1872, p. 245.  
*Apogon opercularis* MacL., P.L.S., N.S.W., ii, 1878, p. 347, pl. vii, fig. 1.  
*Amia conspersa* McCull., Endeavour Res., ii, 1914, p. 103.

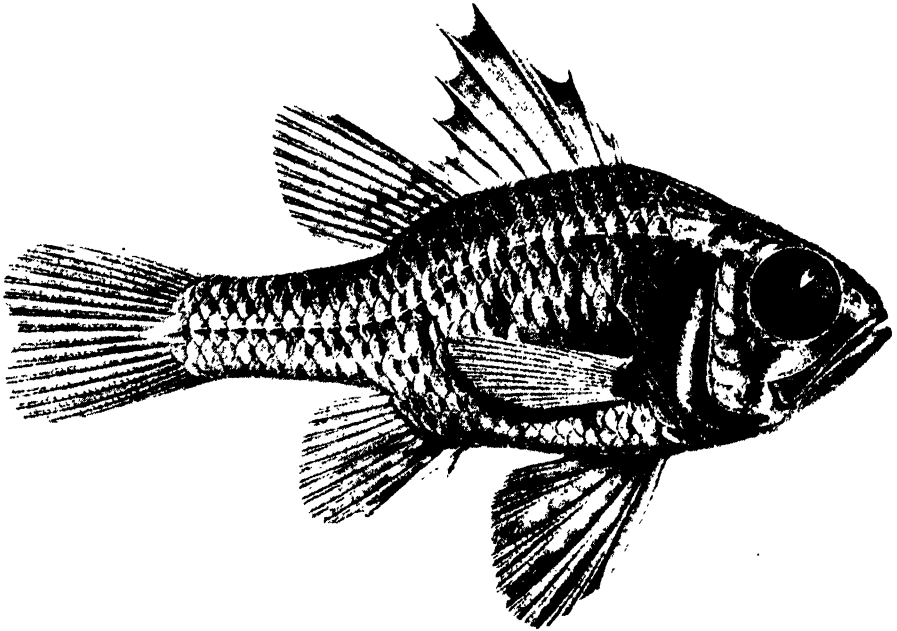


Fig. 150. *Apogon conspersus*.

**DINOLESTES** Klunzinger, 1872 (*mulleri*=*lewini*).

**DINOLESTES LEWINI** Griffith (Long-finned Pike).

- Esox lewini* Griffith, Ann. King., x, 1834, p. 465, pl. lx.  
*Dinolestes muelleri* Klunz., Arch. f. Naturg., 1872, p. 30, pl. iii; Ogil., Edib. Fish. N.S.W., 1893, p. 115.  
*Ncosphyraena multiradiata* Cast., P.Z.S., Viet., i, 1872, p. 97.  
*Lanioperca mordax* Günth., A.M.N.H. (4), x, 1872, p. 183; McCoy, Prod. Zool. Viet., dec. xii, 1886, pl. cxv.  
*Dinolestes lewini* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 30.



Fig. 151. *Dinolestes lewini*.

This fish has no near relationship to the Snook, which is also known as the Short-finned Pike.

## FAMILY SILLAGINIDAE.

### **SILLAGINODES** Gill, 1861 (*punctatus*).

#### **SILLAGINODES PUNCTATUS** Cuvier & Valenciennes (Spotted Whiting).

*Sillago punctata* Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 413; Quoy & Gaim.

Voy. Astrol., iii, 1835, p. 671, pl. i, fig. 1; Stead, Edib. Fish. N.S.W., 1908, p. 66, pl. xxxvi.

*Sillaginodes punctatus* Gill, Proc. Acad. Nat. Sci. Phil., 1861, p. 505.

*Isosillago maculata* MacL., P.L.S., N.S.W., iii, 1878, p. 34, pl. iv, fig. 3 (not Quoy & Gaim.).



Fig. 152. *Sillaginodes punctatus*.

The largest and most esteemed of the Australian Whittings; attains a length of 20 inches.

**SILLAGO Cuvier, 1817 (acuta).**

**SILLAGO BASSENSIS Cuvier & Valenciennes (Bass Whiting).**

*Sillago bassensis* Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 412; Quoy & Gaim., Voy. Astrol., iii, 1835, p. 672, pl. i, fig. 2; Stead, Edib. Fish. N.S.W., 1908, p. 65, pl. xxxv.

*Sillago maculata* Cast., P.Z.S., Viet., i, 1872, p. 94 (not Quoy & Gaim.).

*Sillago ciliata* Johnston, P.R.S., Tasm., 1883, p. 80, 116 (not Cuv. & Val.).

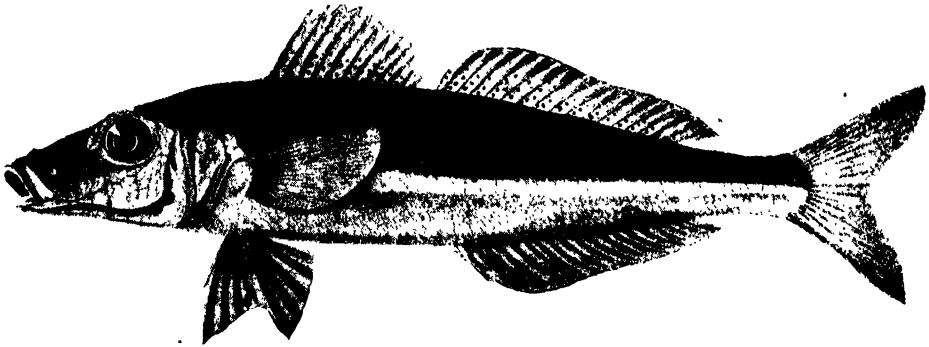


Fig. 153. *Sillago bassensis*.

The Australian Whittings are in no wise related to their European namesakes.

FAMILY CARANGIDAE.

**SCOMBEROIDES Lacepède, 1802 (commersonianus).**

**SCOMBEROIDES TOLOO Cuvier & Valenciennes (Leather-skin).**

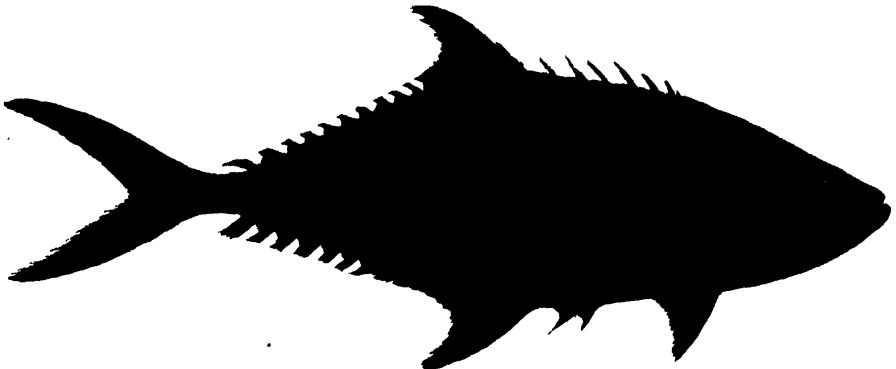


Fig. 154. *Scomberoides toloos*.

*Chorinemus tolooo* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 377; Day, Fish. India, 1878, p. 232, pl. li A. fig. 3; Cast., Res. Fish. Aust., 1875, p. 19 (not *Lichia tolooo-parah* Rüpp.).

**SERIOLA** Cuvier, 1817 (dumerilli).

**SERIOLA GRANDIS** Castelnau (Yellow-tail).

*Seriola grandis* Cast., P.Z.S., Viet., i, 1872, p. 115; McCull., Endeavour Res., iii, 1915, p. 121, pl. xxxv, fig. 1; Roughley, Fish. Aust., 1916, p. 97, pl. xxx.  
*Seriola lalandii* Cast., P.L.S., N.S.W., iii, 1879, p. 352; McCoy, Prod. Zool. Viet., dec. xviii, 1889, pl. clxxii; Ogil., Edib. Fish. N.S.W., 1893, p. 82 (not Cuv. & Val.).

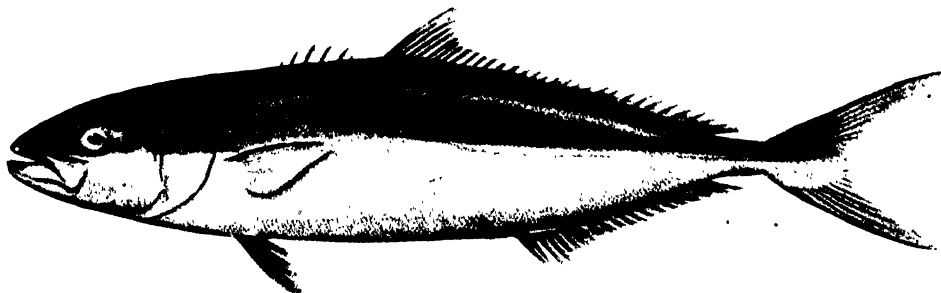


Fig. 155. *Seriola grandis*.

A good edible and sporting fish, attaining a weight of 60 lb.

**TRACHURUS** Rafinesque, 1810 (trachurus).

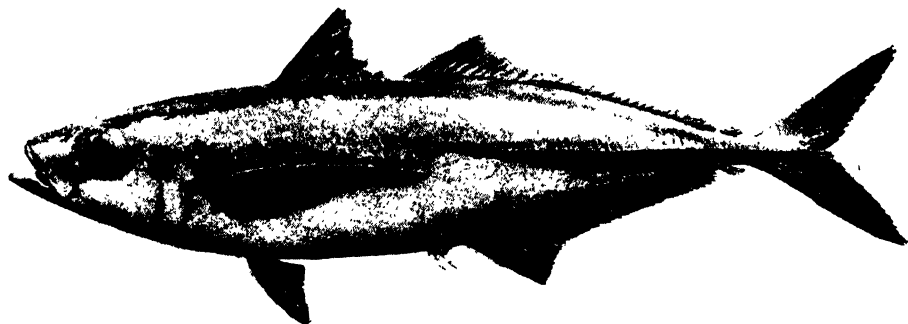
**TRACHURUS NOVAE-ZELANDIAE** Richardson (Horse Mackerel).

*Trachurus novae-zelandiae* Rich., Rep. Brit. Ass., 1843, p. 21; McCull., Endeavour Res., iii, 1915, p. 123, pl. xxxiv, fig. 3.  
*Trachurus trachurus* Hutt., Cat. Fish. N.Z., 1872, p. 16, pl. iii, fig. 23; McCoy, Prod. Zool. Viet., dec. ii, 1878, pl. xviii; Ogil., Edib. Fish. N.S.W., 1893, p. 77 (not Linn.).  
*Trachurus declivis* Waite, Mem. Aust. Mus., iv, 1899, p. 72 (not Jenyns).  
*Dicapterus leptosomus* Stead, Edib. Fish. N.S.W., 1908, p. 87 (not Ogil.).

Very similar to the next species, the differences scarcely to be shown in an illustration.

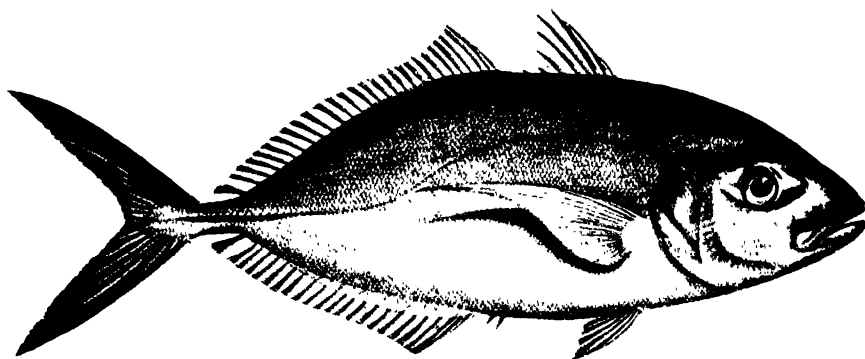
**TRACHURUS DECLIVIS** Jenyns (Sead).

*Caranx declivis* Jenyns, Voy. Beagle, iii, 1842, p. 68, pl. xiv.  
*Trachurus declivis* McCull., Endeavour Res., iii, 1915, p. 125, pl. xxxiv, fig. 2; Roughley, Fish. Aust., 1916, p. 101.

Fig. 157. *Trachurus declivis*.**CARANX** Lacepède, 1802 (*carangus*).**CARANX GEORGIANUS** Cuvier & Valenciennes (Trevally).

*Caranx georgianus* Cuv. & Val., Hist. Nat. Poiss., ix, 1833, p. 85; Rich., Zool. Ereb. & Terr., 1848, p. 135, pl. lviii, fig. 1-3; Ogil., Edib. Fish. N.S.W., 1893, p. 80, pl. xxiv; Stead, Edib. Fish. N.S.W., 1908, p. 87, pl. lvii; McCull., Endeavour Res., iii, 1915, p. 126, pl. xx; Roughley, Fish. Aust., 1916, p. 95, pl. xxix.

*Caranx nobilis* Mael., P.L.S., N.S.W., v, 1881, p. 532.

Fig. 158. *Caranx georgianus*.

Grows to 30 inches in length; it is an excellent food fish and is used fresh, salted, or smoked.

## FAMILY POMATOMIDAE.

**POMATOMUS** Lacepède, 1802 (*skib* = saltator).**POMATOMUS SALTATOR** Linnaeus (Skipjack).

*Pcrea saltatrix* Linn., Syst. Nat. (ed. x), 1758, p. 293.



*Temnodon saltator* Cuv. & Val., Hist. Nat. Poiss., ix, 1833, p. 225, pl. cclx; Valenc. in Cuv., Règ. Anim. III. Poiss., 1839, pl. lvi, fig. 3; McCoy, Prod. Zool. Viet., dec. xix, 1889, pl. clxxxiii; Ogil., Edib. Fish. N.S.W., 1893, p. 86, pl. xxv (ref.).

*Pomatomus saltatrix* Jord. & Gilb., Bull. U.S. Nat. Mus., xvi, 1883, p. 914; Stead, Edib. Fish. N.S.W., 1908, p. 90, pl. lxi; Roughley, Fish. Aust., 1916, p. 108, pl. xxxiv.

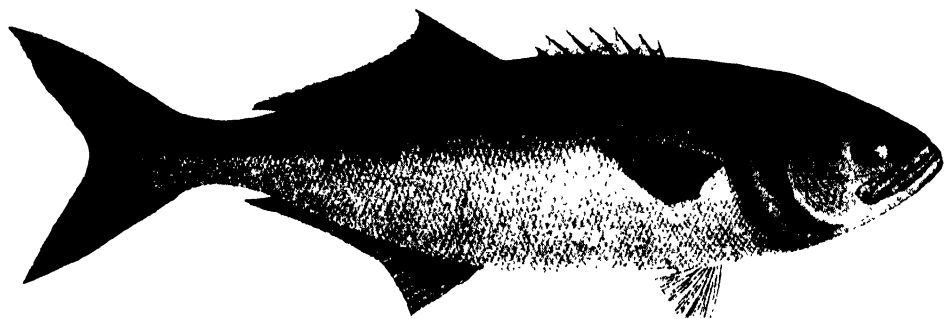


Fig. 159. *Pomatomus saltator*.

Owing to the circumstance that it cuts the fishermen's nets it is also known as "Tailor." It is commonly taken in the seine net, but also affords sport to the angler. Is good food, but must be eaten quite fresh.

## FAMILY ARRIPIDIDAE.

### **ARRIPIS** Jenyns, 1842 (georgianus).

#### **ARRIPIS TRUTTA** Forster (Australian Salmon).

*Sciæna trutta* Forst., in Bl. & Seim., Syst. Ichth., 1801, p. 542.

?*Perca trutta* and *P. marginata* Cuv. & Val., Hist. Nat. Poiss., ii, 1828, p. 53, 54.

*Centropristes truttaceus* Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 50.

*Centropristes salar* Rich., P.Z.S., 1839, p. 95 and T.Z.S., iii, 1849, p. 78 and Zool. Ereb. & Terr., 1845, p. 29, pl. xx, fig. 4-6.

*Centropristes tasmanicus* Homb. & Jacq., Voy. Pole Sud, iii, 1853, p. 40, pl. iv, fig. 1.

*Arripis salar* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 253; Ogil., Edib. Fish. N.S.W., 1893, p. 20, pl. ix.

*Arripis truttaceus* Günth., *op. cit.* p. 254; McCoy, Prod. Zool. Viet., dec. ii, 1878, pl. xvi, xvii.

*Arripis trutta* Gill, Mem. Nat. Acad. Sci., vi, 1893, p. 116; Roughley, Fish. Aust., 1916, p. 117, pl. xxxvii.

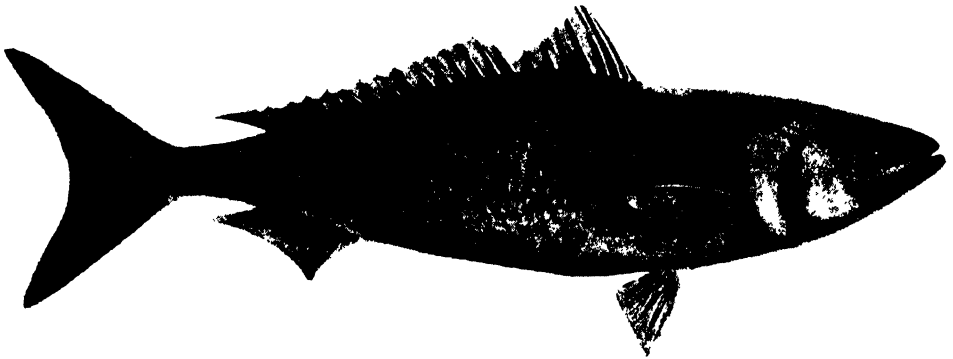


Fig. 160. *Arripis trutta*.

Appears in summer in enormous shoals. Adults are not greatly prized as food, but half-grown examples, known as Salmon Trout, are by no means despised. Gives good sport to anglers.

**ARRIPIS GEORGIANUS** Cuvier & Valenciennes (Tommy Rough, Wankaldi).

*Centropristes georgianus* Cuv. & Val., Hist. Nat. Poiss., vii, 1831, p. 451; Rich., Zool. Ereb. & Terr., 1848, p. 117, pl. liv., fig. 3-6.

*Arripis georgianus* Jenyns, Voy. Beagle, 1842, p. 14; McCoy, Prod. Zool. Viet., dec. xix, 1889, pl. clxxxiv.

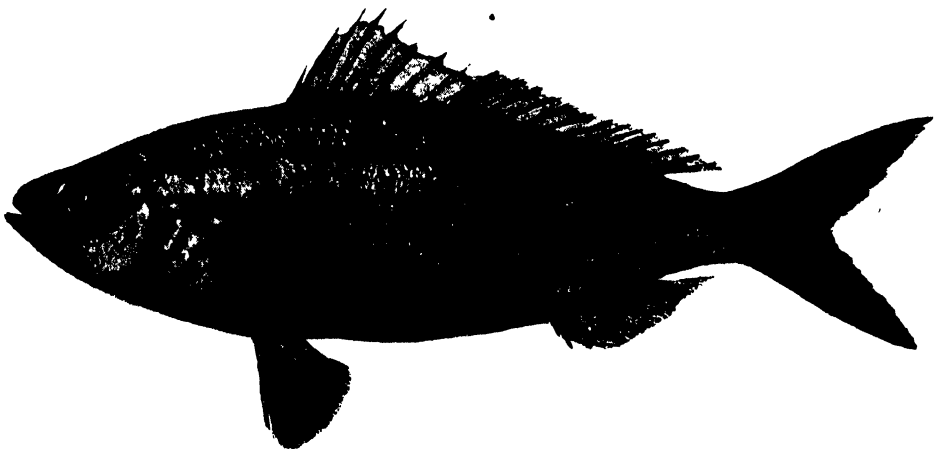
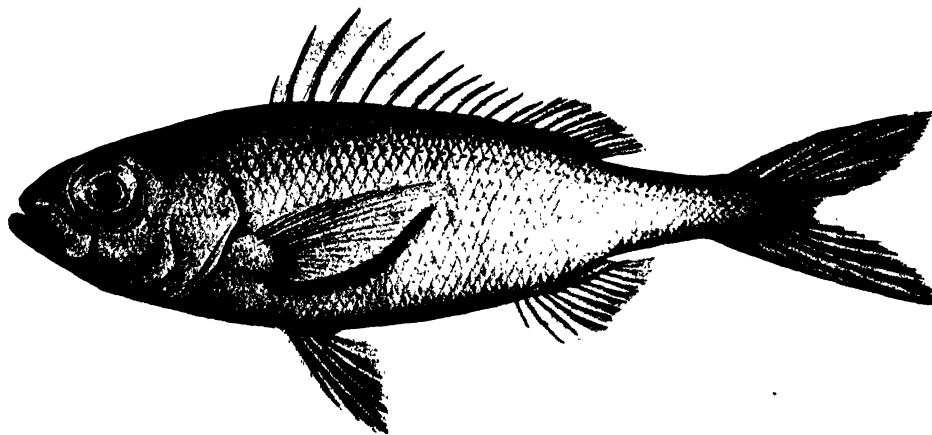


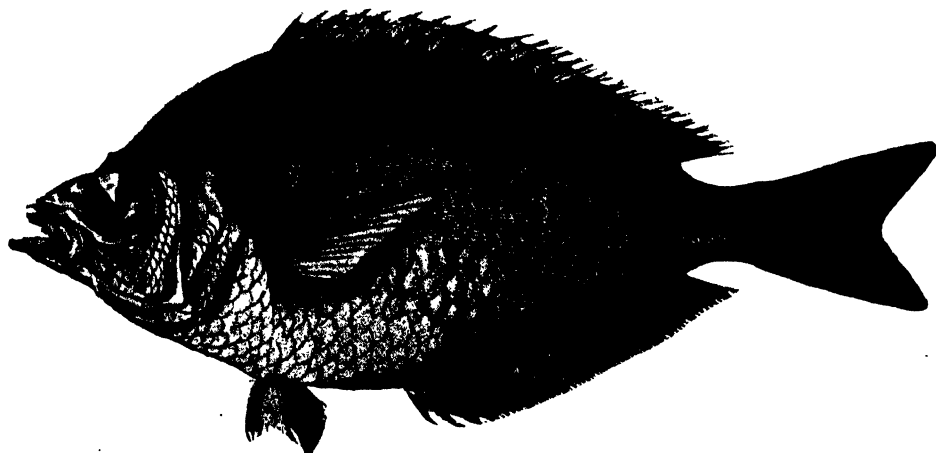
Fig. 161. *Arripis georgianus*.

A small fish, but plentiful and much appreciated as food.

## FAMILY ERYTHRICHTHYIDAE.

**PLAGIOGENEION** Forbes, 1890 (rubiginosus).**PLAGIOGENEION MACROLEPIS** McCulloch (Ruby Fish).*Plagiogeneion macrolepis* McCull., Endeavour Res., ii, 1914, p. 104, pl. xx.Fig. 162. *Plagiogeneion macrolepis*.

## FAMILY GERRIDAE.

**PAREQUULA** Steindachner, 1879 (bicornis).**PAREQUULA MELBOURNENSIS** Castelnau.*Gerres melbournensis* Cast., P.Z.S., Viet., i, 1872, p. 158.*Cithamalopteryx melbournensis* Ogil., P.Z.S., 1887, p. 616, fig.Fig. 163. *Parequula melbournensis*.

## FAMILY SCIAENIDAE.

**SCIAENA** Linnaeus, 1758 (*umbra*).**SCIAENA ANTARCTICA** Castelnau (*Butterfish, Mulloway*).

*Sciaena antarctica* Cast., P.Z.S., Viet., i, 1872, p. 100; Ten. Woods, Fish. N.S.W., 1883, p. 53, pl. xvi; Stead, Fish. Aust., 1906, p. 113, fig. 42 and Edib. Fish.

N.S.W., 1908, p. 66, pl. xxxvii; Roughley, Fish. Aust., 1916, p. 112, pl. xxxv.

*Corvina axillaris* De Vis., P.L.S., N.S.W., ix, 1884, p. 538.

*Sciaena neglecta* Rams. & Ogil., P.L.S., N.S.W. (2), i, 1886, p. 941.

*Sciaena aquila* Ogil., Edib. Fish. N.S.W., 1893, p. 72, pl. xxii.

*Sciaena hololepidota antarctica* Ogil., Mem. Qld. Mus., vi, 1918, p. 70, pl. xxi.

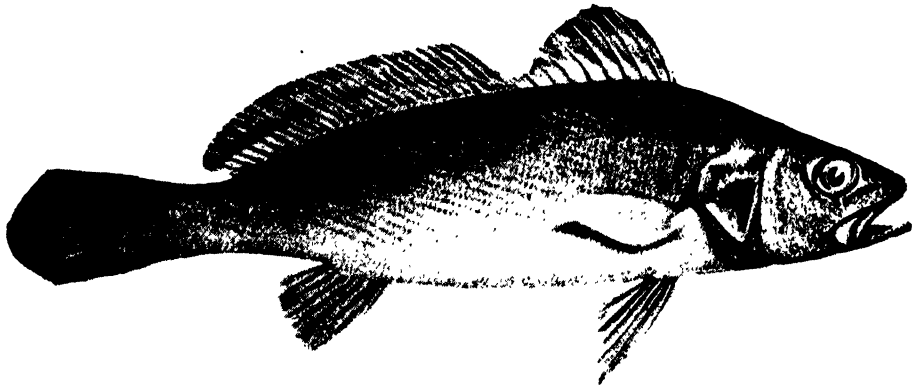


Fig. 164. *Sciaena antarctica*.

One of the most popular food fishes of the State, plentiful, and of good keeping quality.

## FAMILY MULLIDAE.

**UPENEUS** Cuvier, 1829 (*bifasciatus*).**UPENEUS POROSUS** Cuvier & Valenciennes (*Red Mullet*).

*Upeneus porosus* Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 455.

*Upeneichthys porosus* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 400; Roughley, Fish. Aust., 1916, p. 139, pl. xlv.

*Upeneichthys vlamingii* Hect., T.N.Z. Inst., ix, 1877, p. 465, pl. ix, fig. 5.

*Hypeneus vlamingii* and *H. porosus* Ogil., Cat. Fish. N.S.W., 1886, p. 17.

*Mullus porosus* Ogil., Edib. Fish. N.S.W., 1893, p. 33.

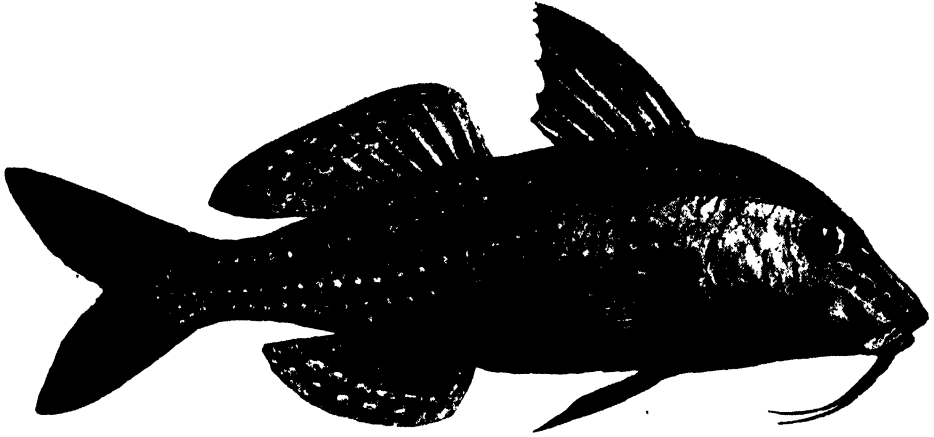


Fig. 165. *Upeneus porosus*.

As much appreciated as was its Mediterranean congener by the Romans of old.

FAMILY SPARIDAE.

**PAGROSOMUS** Gill, 1893 (*auratus*).

**PAGROSOMUS AURATUS** Foster (Snapper)

*Sciæna aurata* Forst., in Bl. & Schn., Syst. Ichth., 1801, p. 266.

*Chrysophrys unicolor* Quoy & Gaim., Voy. Uran. & Physic., 1824, p. 299.

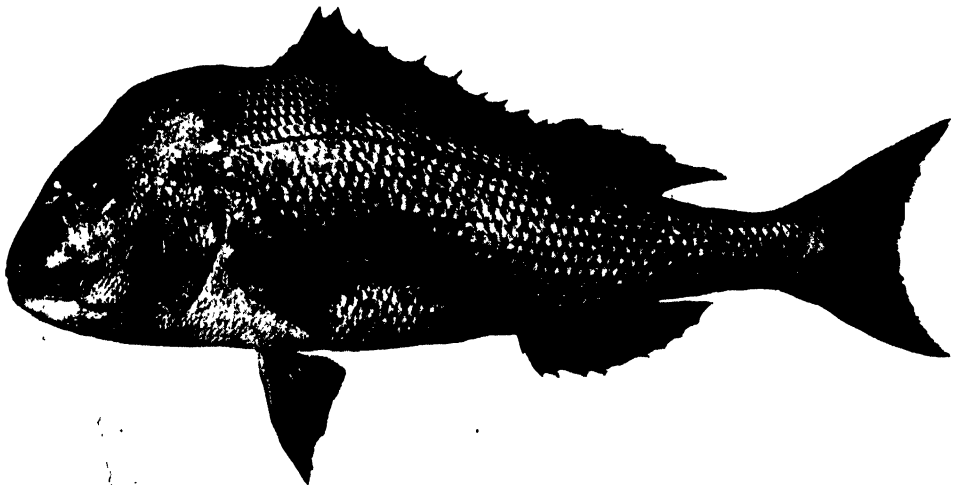


Fig. 166. *Pagrosomus auratus*.

*Pagrus unicolor* Cuv. & Val., Hist. Nat. Poiss., vi, 1830, p. 162; Ten. Woods, Fish. N.S.W., 1883, p. 39, pl. viii and frontispiece; Ogil., Edib. Fish. N.S.W., 1893, p. 47, pl. xiii.

*Pagrus guttulatus* and *P. micropterus* Cuv. & Val., Hist. Nat. Poiss., vi, 1830, p. 160, 163.

*Pagrus latus* Rich., Rep. Brit. Ass., 1842, p. 209.

*Chrysophrys gibbiceps* Canestrini, Arch. Zool. Anat. (2), i, 1869, p. 154.

*Pagrosomus* (and *Sparosomus*) *auratus* Gill, Nat. Acad. Sci., vi, 1893, p. 97, 116, 123; Stead, Edib. Fish. N.S.W., 1908, p. 75, pl. xlv; Roughley, Fish. Aust., 1916, p. 130, frontispiece and pl. xlii (young).

The best known Australian food fish, generally caught with hand lines; seldom trawled as in New Zealand.

**SPARUS Linnaeus, 1758 (*aurata*).**

**SPARUS AUSTRALIS Günther (Black Bream).**

*Chrysophrys australis* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 494; McCoy, Prod. Zool. Viet., dec. i, 1878, pl. iv; Stead, Edib. Fish. N.S.W., 1908, p. 77, pl. xlv.

*Chrysophrys sarba* Cast., P.L.S., N.S.W., iii, 1879, p. 373 (not Forsk.).

*Pagrus australis* Ogil., Edib. Fish. N.S.W., 1893, p. 51, pl. xv.

*Sparus australis* Roughley, Fish. Aust., 1916, p. 134, pl. xliii.

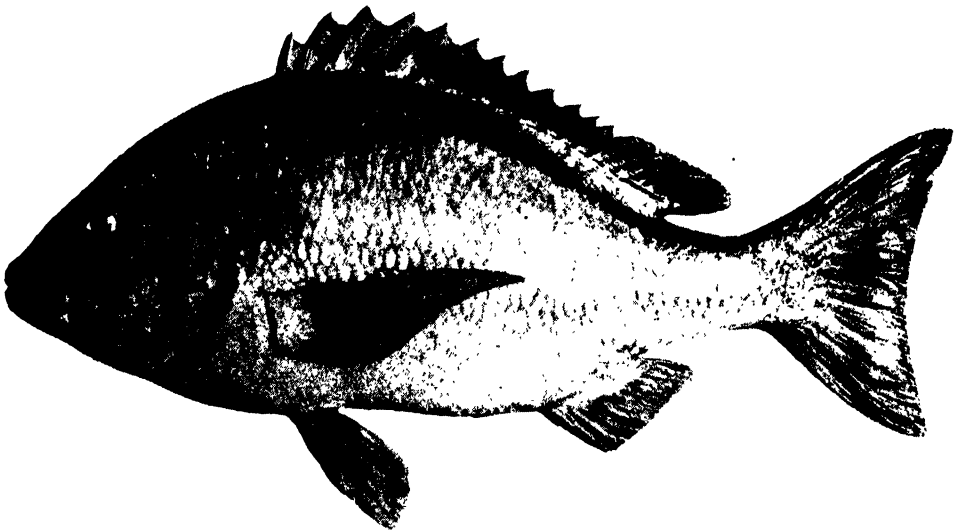


Fig. 167. *Sparus australis*.

A prime favourite with anglers, and said to require a most "delicate finger" for its capture. A delicious table fish.

### FAMILY PEMPHERIDAE.

**LIOPEMPHERIS** Ogilby, 1913 (multiradiata). [? **CATALUFA** Snyder, 1911.]

**LIOPEMPHERIS MULTIRADIATA** Klunzinger (Bull's-eye).

*Pempheris multiradiatus* Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 381.

*Pempheris macrolepis* MacL., P.L.S., N.S.W., v, 1881, p. 516; Waite, Mem. Aust. Mus., iv, 1899, p. 73, pl. x.

*Pempheris lineatus* Ogil., P.L.S., N.S.W., x, 1885, p. 447.

*Liopempheris multiradiata* Ogil., Mem. Qld. Mus., ii, 1913, p. 66.

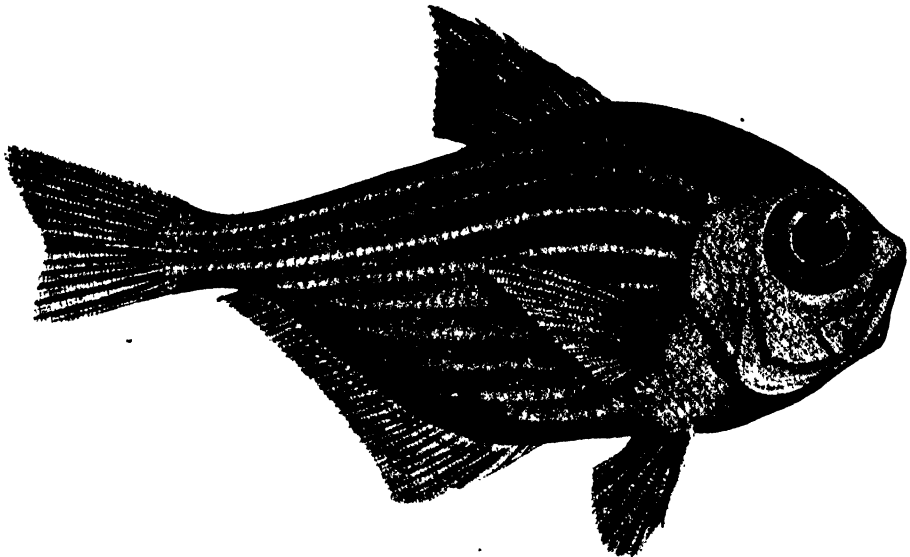


Fig. 168. *Liopempheris multiradiata*.

Members of this Family are not of economic importance.

**PEMPHERIS** Cuvier, 1829 (argenteus).

**PEMPHERIS KLUNZINGERI** McCulloch.

*Pempheris muelleri* Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 380, pl. vi (not Poey).

*Pempheris klunzingeri* McCull., Endeavour Res., i, 1911, p. 47.

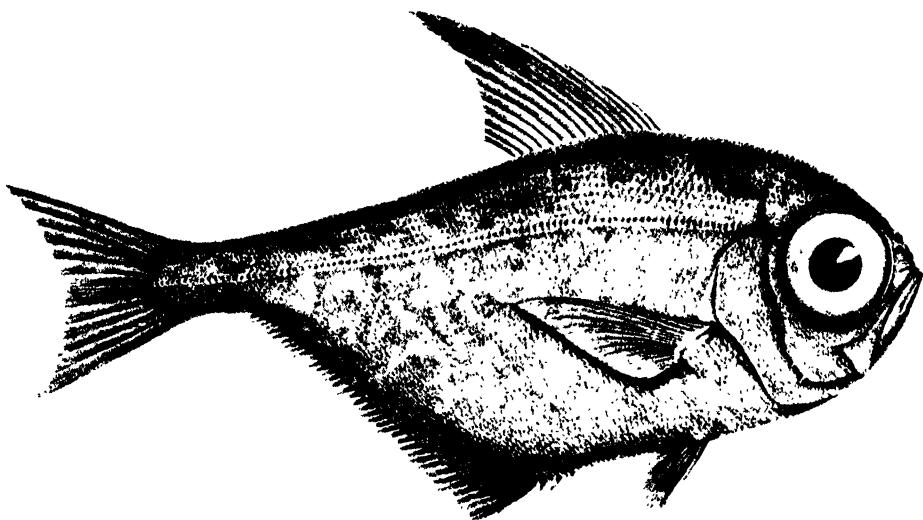


Fig. 169. *Pempheris klunzingeri*.

**PARAPRIACANTHUS** Steindachner, 1870 (*ransonneti*).

**PARAPRIACANTHUS ELONGATUS** McCulloch.

*Pempheris elongata* McCull., Endeavour Res., i, 1911, p. 47, pl. iv, fig. 1.

*Parapriacanthus elongatus* Ogil., Mem. Qld. Mus., ii, 1913, p. 67.

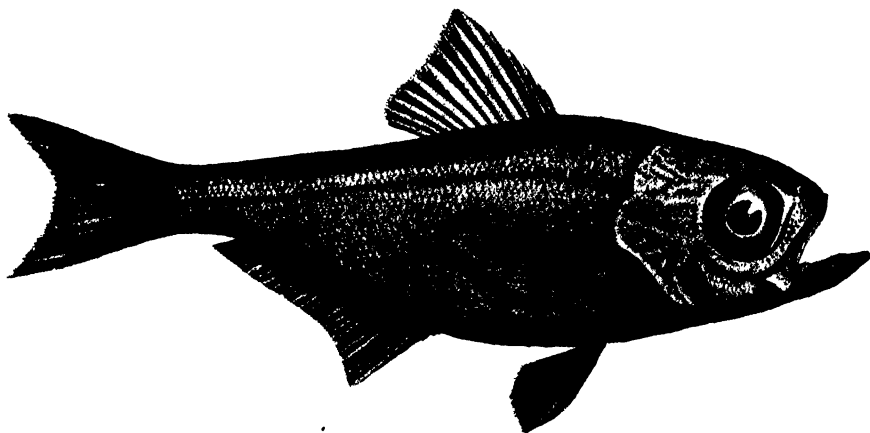


Fig. 170. *Parapriacanthus elongatus*.



## FAMILY SCORPIDIDAE.

**SCORPIS Cuvier & Valenciennes, 1831** (*georgianus*).

**SCORPIS GEORGIANUS Cuvier & Valenciennes** (Banded Sweep).

*Scorpis georgianus* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 503, pl. cexlv;  
Rich., Zool. Ereb. & Terr., 1848, p. 121.

It is possible that this may prove to be the young of *S. acquipinnis*.

**SCORPIS AEQUIPINNIS Richardson** (Sweep).

*Scorpis acquipinnis* Rich., Zool. Ereb. & Terr., 1848, p. 121; Ogil., Edib. Fish.  
N.S.W., 1893, p. 38, pl. x; McCull., Rec. Aust. Mus., xi, 1917, p. 177, fig. 2;  
Roughley, Fish. Aust., 1916, p. 141, pl. xlv

*Scorpis lineolatus* Kner, Reise Novara, 1865, p. 108, pl. v, fig. 3.

*Scorpis boops* Peters, Sitzb., Akad. Berlin, 1866, p. 519.

*Scorpis richardsonii* Steind., Sitz. Akad. Wiss. Wien. liii, 1866, p. 437, pl. v,  
fig. 1.

*Scorpis oblungus* Canestrini, Arch. Zool. Anat. (2), i, 1869, p. 153.

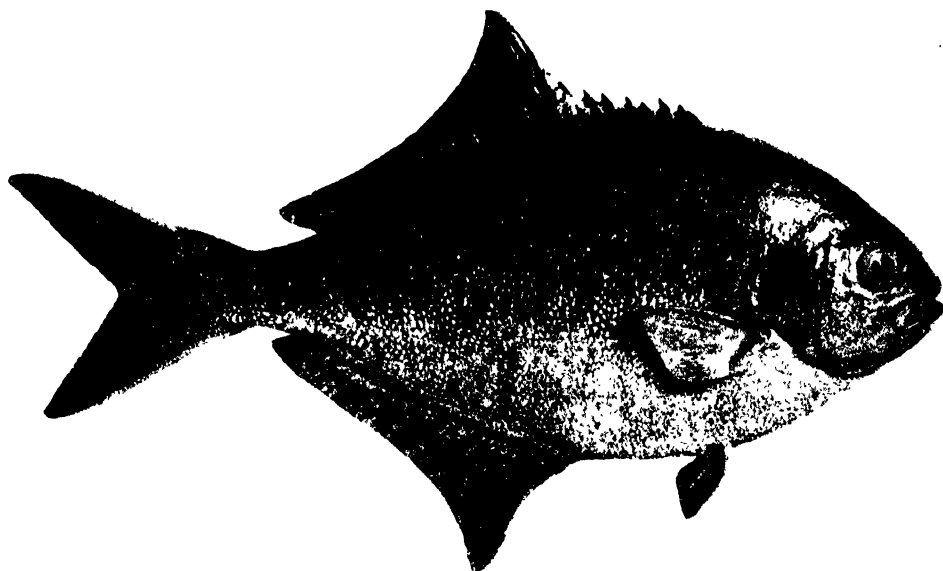
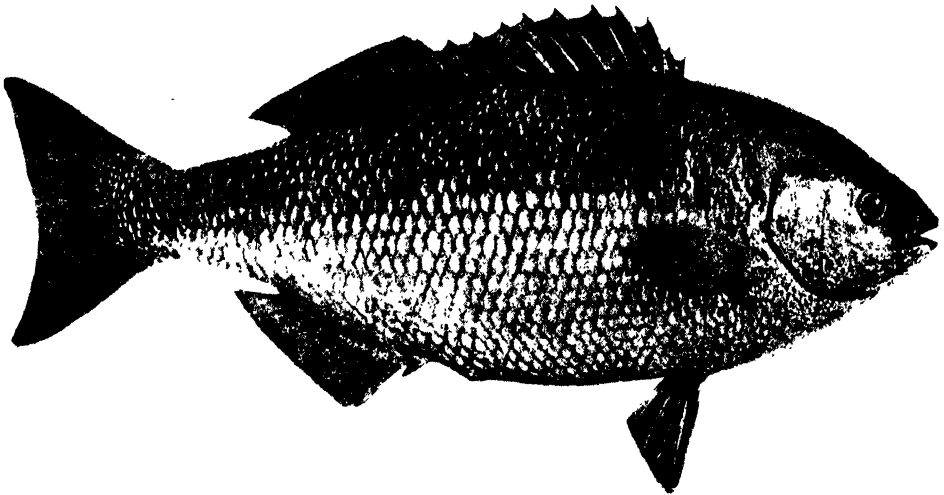


Fig. 172. *Scorpis acquipinnis*.

The Sweep is a favourite food and sporting fish, and always find a ready sale.

## FAMILY KYPHOSIDAE.

**KYPHOSUS** Lacepède, 1802 (*bigibbus*).**KYPHOSUS SYDNEYANUS** Günther (Drummer).*Pachymetopon grande* MacL., P.L.S., N.S.W., v, 1881, p. 406 (not Günth.).*Pimblepterus sydneyanus* Günth., A.M.N.H. (5), xviii, 1886, p. 368; Ogil., Edib. Fish. N.S.W., 1893, p. 40, pl. xvi.*Pimblepterus meridionalis* Ogil., P.Z.S., 1886, p. 539.*Kyphosus sydneyanus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 26; Roughley, Fish. Aust., 1916, p. 58, pl. xv; McCull., Rec. Aust. Mus., xiii, 1920, p. 56, pl. xii, fig. 2.Fig. 173. *Kyphosus sydneyanus*.

Though attaining a length of 30 inches, this fish is not regarded with favour it does not take an animal bait.

## FAMILY GIRELLIDAE.

**GIRELLA** Gray, 1833 (*punctata*).**GIRELLA TRICUSPIDATA** Quoy & Gaimard (Blackfish).

*Boops tricuspidatus* Quoy & Gaim., Voy. Uranie & Physic., 1824, p. 296.

*Oblata tricuspidata* Cuv. & Val., Hist. Nat. Poiss., vi, 1830, p. 372.

*Crenidens triglyphus* Rich., Zool. Ereb. & Terr., 1845, p. 36, pl. xxv., fig. 2.

*Crenidens simplex* Rich., *op. cit.*, 1846, p. 120.

*Girella tricuspidata* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 428; Ogil., Edib. Fish. N.S.W., 1893, p. 42, pl. xii; Stead, Edib. Fish. N.S.W., 1908, p. 49, pl. xix; Roughley, Fish. Aust., 1916, p. 52, pl. xii; McCull, Rec. Aust. Mus., xiii, 1920, p. 60, pl. xiv, fig. 1 (syn.).

*Girella simplex* Günth., *op. cit.* p. 429; McCoy, Prod. Zool. Viet., dec. viii, 1883, pl. lxxiii; Ogil., Edib. Fish. N.S.W., 1893, p. 44.

*Melanichthys tricuspidata* and *M. simplex* Cast., P.Z.S., Viet., i, 1872, p. 67, 68.

*Melanichthys blackii* Cast., *op. cit.*, ii 1873, p. 41.

*Girella percoides* Hect., Trans. N.Z. Inst., vii, 1875, p. 243, pl. x, fig. 6d.

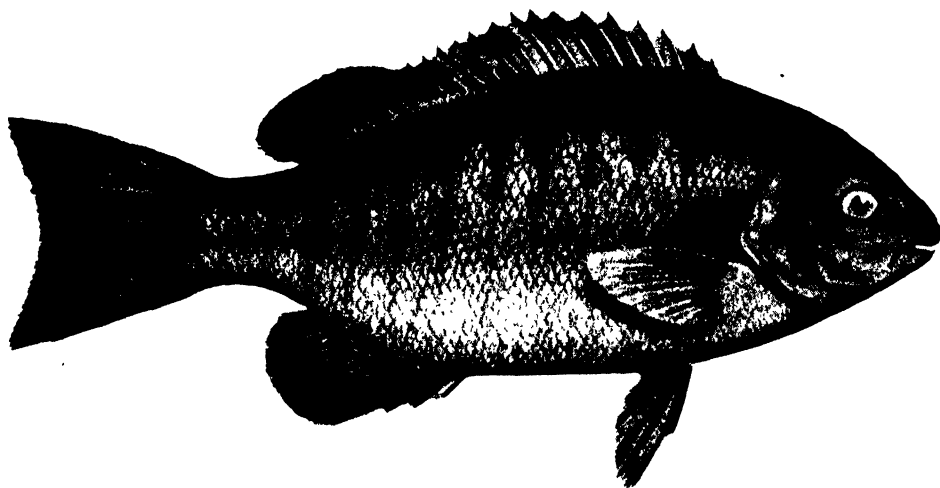


Fig. 174. *Girella tricuspidata*.

Our two species of this Family, being vegetable feeders, are of indifferent flavour and poor keeping quality. They may be caught with seaweed as a bait.

**TEPHRAEOPS** Günther, 1859 (tephraeops).

**TEPHRAEOPS ZEBRA** Richardson (Zebra Fish).

*Crenidens zebra* Rich., Zool. Ereb. & Terr., 1846, p. 70.

- Tephraeops zebra* Günth., Cat. Fish. Brit. Mus., i, 1859, p. 432.  
*Girella zebra* Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 430, pl. vi, fig. 2.  
*Girellichthys zebra* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 22.  
*Neotephroeops zebra* Cast., P.R.S., Vict., i, 1872, p. 69.  
*Mcclambasis zebra* Cast., *op. cit.*, ii, 1873, p. 42.

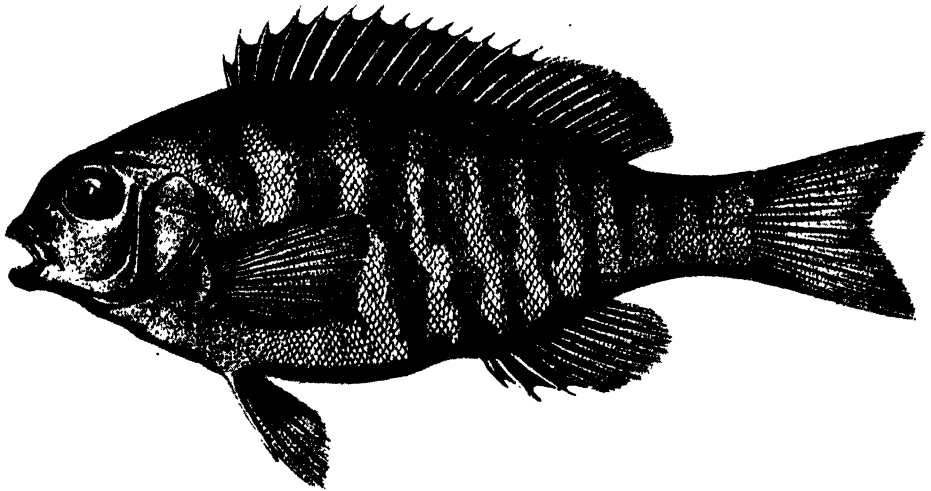


Fig. 175. *Tephraeops zebra*.

## FAMILY CHAETODONTIDAE.

**VINCULUM McCulloch, 1914 (sexfasciatum).**

**VINCULUM SEXFASCIATUM Richardson (Six-banded Coral-fish).**

- Chaetodon sexfasciatus* Rich., A.M.N.H., x, 1842, p. 26.  
*Chaetodon ocellipinnis* Mael., P.L.S., N.S.W., iii, 1878, p. 33, pl. iii, fig. 1 (young).  
*Vinculum sexfasciatum* McCull., Endeavour Res., ii, 1914, p. 110, pl. xxii.  
*Vinculum ocellipinnis* McCull., *op. cit.*, iv, 1916, p. 193.



Fig. 176. *Vinculum scrfasciatum*.

A dainty well-fleshed fish, said to be most readily caught at night, whence one of its cognomens, The Moonlighter.

**CHELMONOPS** Bleeker, 1876 (*truncatus*).

**CHELMONOPS TRUNCATUS** Kner.

*Chaetodon truncatus* Kner, Sitzb. Akad. Wiss. Wien, xxxiv, 1859, p. 442, pl. ii.

*Chelmo trochilus* Günth., A.M.N.H. (4), xiv, 1874, p. 368.

*Chelmonops truncatus* Bleek., Arch. Neerl. Sci. Nat., xi, 1876, p. 304.

FAMILY ENOPILOSIDAE.

**ENOPILOSUS** Lacepède, 1802 (*armatus*).

**ENOPILOSUS ARMATUS** Shaw (Old Wife).

*Chaetodon armatus* Shaw, in White's Voy. N.S.W., 1790, p. 254, pl. xxxix, fig. 1.  
*Enoplosus white* Lacep., Hist. Nat. Poiss., iv, 1803, p. 541.

*Enoplosus armatus* Cuv. & Val., Hist. Nat. Poiss., ii, 1828, p. 133, pl. xx; Ten. Woods, Fish. N.S.W., 1883, p. 32, pl. ii; Ogil., Edib. Fish. N.S.W., 1893, p. 6; Stead, Edib. Fish. N.S.W., 1908, p. 62, pl. xxxii; Roughley, Fish. Aust., 1916, p. 85, pl. xxvi.

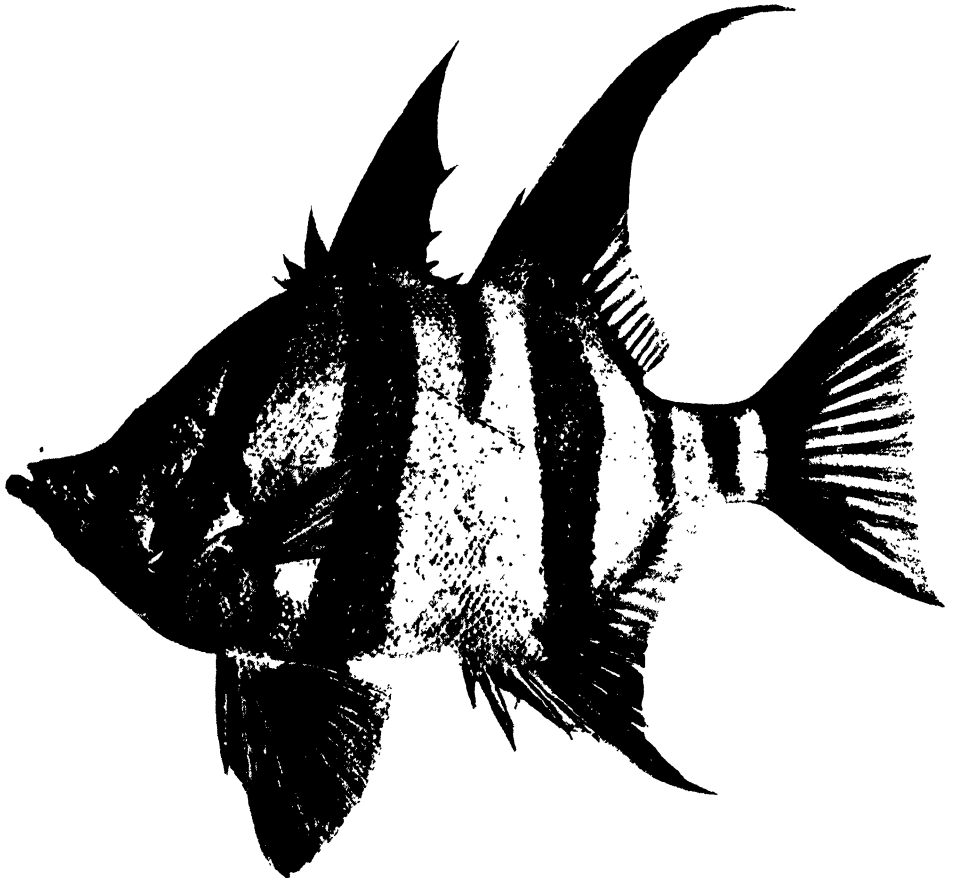


Fig. 178. *Enoplosus armatus*.

A good little fish, but owing to its frequenting rocky localities cannot be taken with a net.

#### FAMILY HISTIOPTERIDAE.

**PENTACEROPSIS** Steindachner, 1883 (*recurvirostris*).

**PENTACEROPSIS RECURVIROSTRIS** Richardson (Striped Boar-fish).

*Histiopertus recurvirostris* Rich., Zool. Ereb. & Terr., 1845, p. 34, pl. xxii, fig. 5-6;  
Canestrini, Arch. Zool. Anat. (2), i. 1869, p. 152, pl. ii.

*Pentaceropsis recurvirostris* Steind. & Doder., Denkschr. Akad. Wiss. Wien, xlviii,  
1883, p. 13 (footnote), pl. vi.

*Prosoplismus recurvirostris* Waite, Rec. Aust. Mus., v, 1903, p. 58, pl. vi.

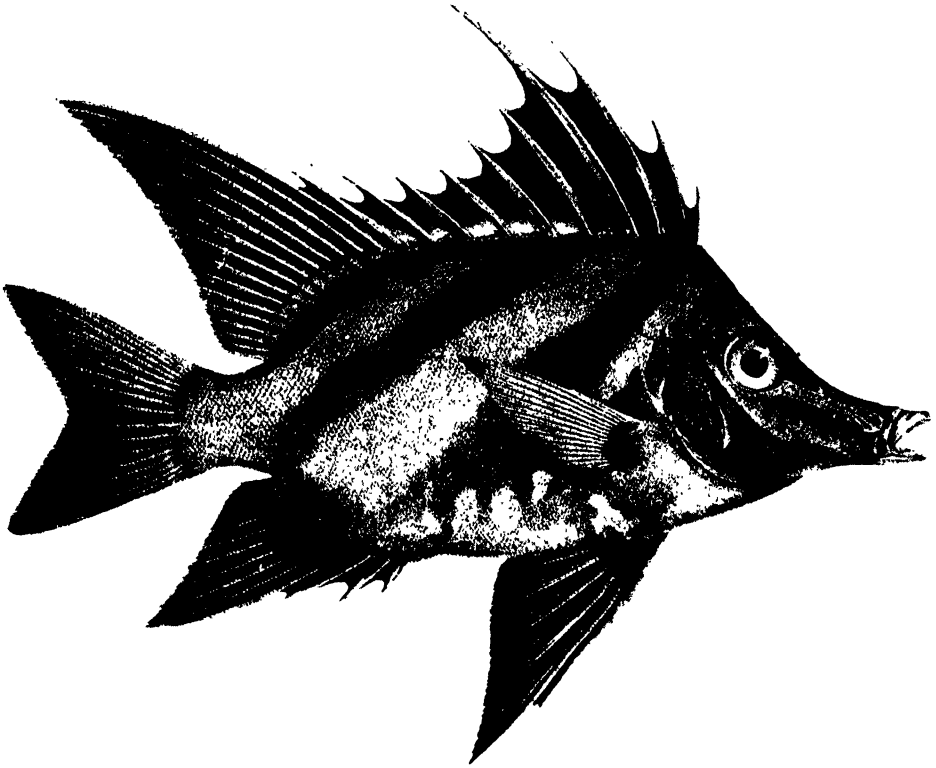


Fig. 179. *Pentaceropsis recurvirostris*.

The Boar-fishes are excellent food, but owing to the non-employment of the trawl are seldom seen in our markets.

**ZANCLISTIUS** Jordan, 1907 (*elevatus*).

**ZANCLISTIUS ELEVATUS** Ramsay & Ogilby (Short Boar-fish).

*Histiopodus elevatus* Rams. & Ogil., P.L.S., N.S.W. (2), iii, 1888, p. 1311;  
Waite, Mem. Aust. Mus., iv, 1899, p. 114, pl. xxvi; Stead, Edib. Fish.  
N.S.W., 1908, p. 75, pl. xlv.

*Zanclistius elevatus* Jord., Proc. U.S. Nat. Mus., xxxii, 1907, p. 236; McCull.,  
Endeavour Res., i, 1911, p. 67, fig. 14-18.

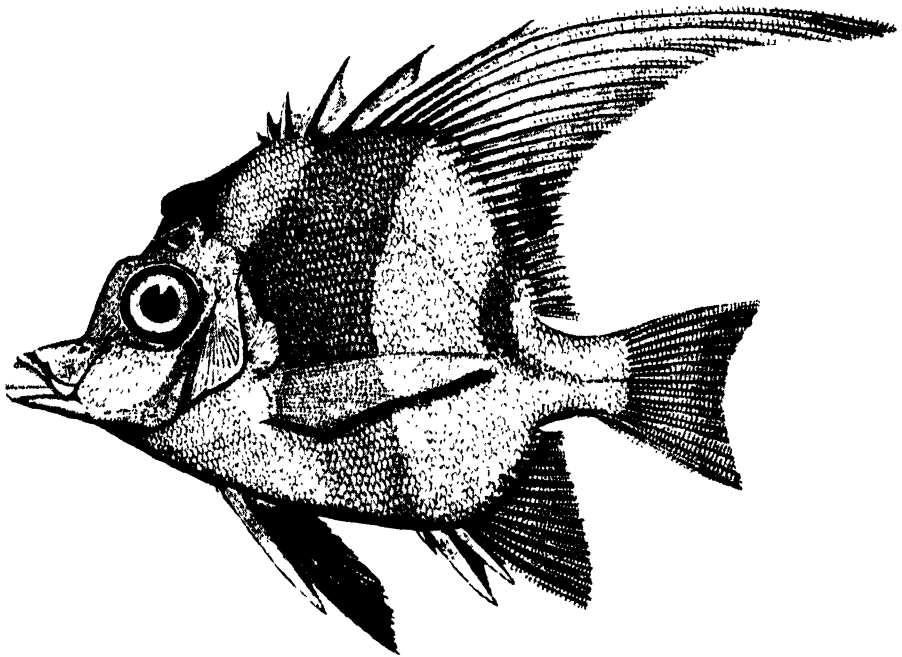


Fig. 180. *Zanclistius elevatus*.

**QUINQUARIUS** Jordan, 1907 (*japonicus*).

**QUINQUARIUS HENDECACANTHUS** McCulloch.

*Quinquarius hendecacanthus* McCull., Endeavour Res., iii, 1915, p. 144, pl. xxvi,  
fig. 1-3.



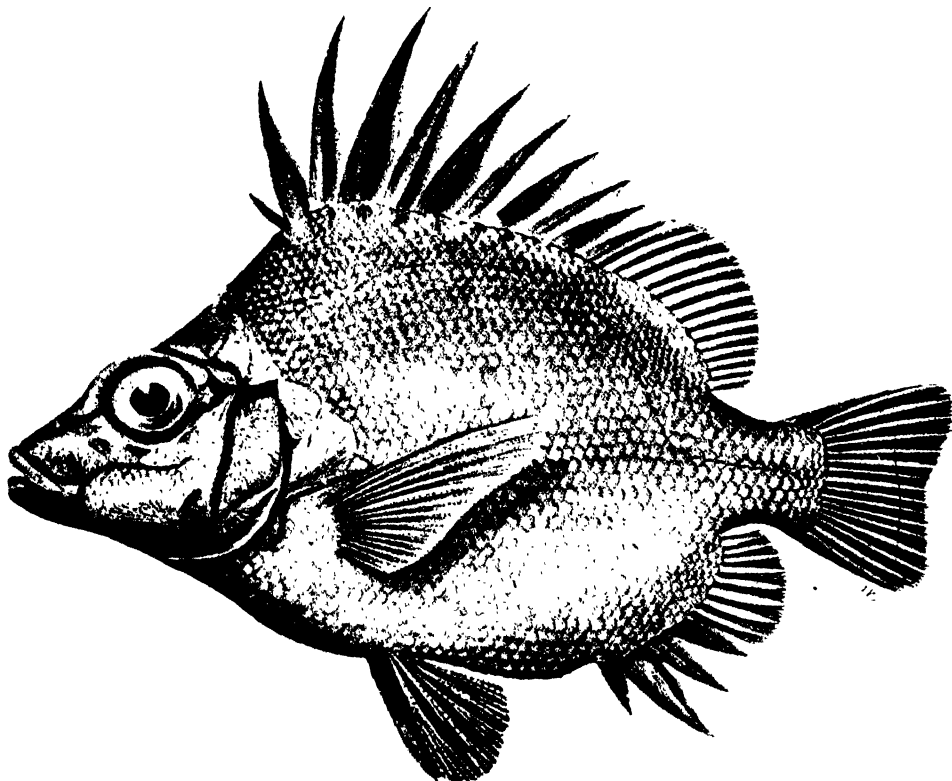


Fig. 181. *Quinquarius lendeacanthus*.

**PARISTIOPTERUS** Bleeker, 1876 (*labiosus*).

**PARISTIOPTERUS LABIOSUS** Günther (Boar-fish)

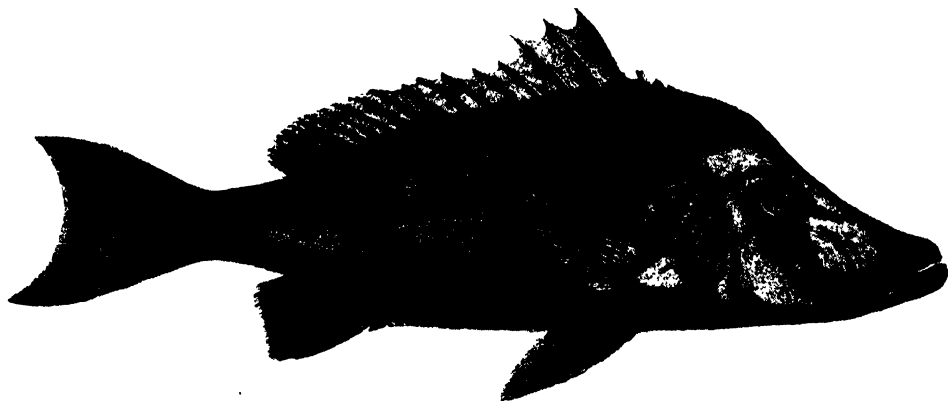


Fig. 182. *Paristiopterus labiosus*.

- Histioporus labiosus* Günth., P.Z.S., 1871, p. 658, pl. lix; Ogil., Edib. Fish. N.S.W., 1893, p. 29, pl. vii.  
*Richardsonia insignis* Cast., P.Z.S., Viet., i, 1872, p. 112.  
*Paristiopterus labiosus* Bleek., Arch. Neerl. Sci. Nat., xi, 1876, p. 268.  
*Histioporus farnelli* Waite, Thetis Prelim. Rep., 1898, p. 33, pl. iv and Mem. Aust. Mus., iv, 1899, p. 116, pl. xxvii.  
*Maccullochia labiosa* Waite, Proc. N.Z. Inst., i, 1910, p. 25; Roughley, Fish. Aust., 1916, p. 127, pl. xli.

## FAMILY OPLEGNATHIDAE.

**OPLEGNATHUS** Richardson, 1840 (*conwail*).

**OPLEGNATHUS WOODWARDI** Waite (Knife-jaw).

- Hoplegnathus woodwardi* Waite, Rec. Aust. Mus., iii, 1900, p. 212, pl. xxxvii.  
*Oplegnathus woodwardi* Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 464; McCull., Endeavour Res., iv, 1916, p. 187, pl. liv (young).  
*Hoplegnathus australis* Regan, Ann. Durban Mus., i, 1916, p. 169.

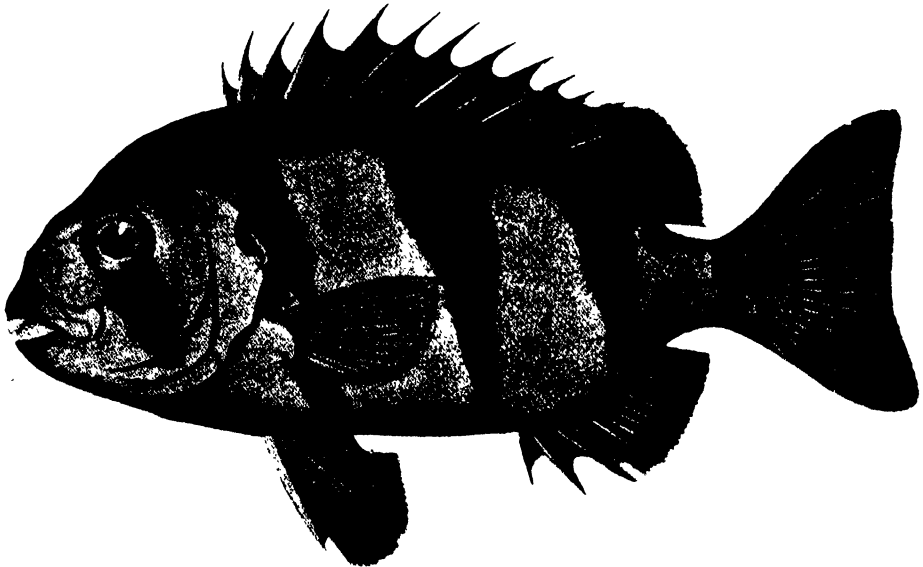


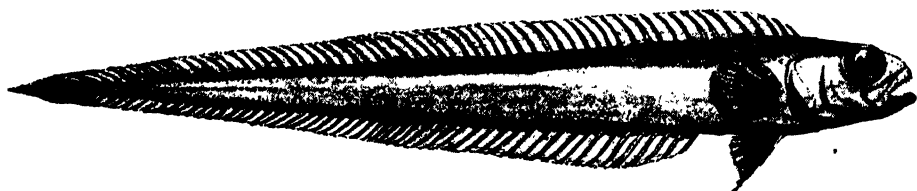
Fig. 183. *Oplegnathus woodwardi*.

Easily recognized from the fact that its teeth are fused into a pair of plates, whence the term **Knife-jaw**.

## FAMILY CEPOLIDAE.

**CEPOLA** Linnaeus, 1764 (*rubescens*).**CEPOLA AUSTRALIS** Ogilby (Band Fish).

*Cepola australis* Ogil. P.L.S., N.S.W., xxiv, 1889, p. 185; McCull., Endeavour Res., ii, 1914, p. 109, pl. xxxiv, fig. 1.

Fig. 184. *Cepola australis*.

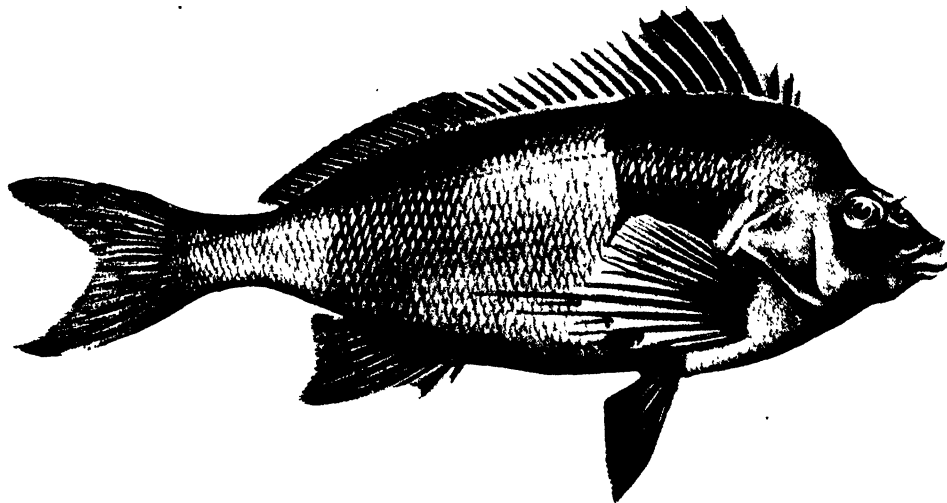
## DIVISION CIRRHITIFORMES.

## FAMILY CHEILODACTYLIDAE.

**GONIISTIUS** Gill, 1862 (*zonatus*).**GONIISTIUS VIZONARIUS** Kent (Magpie Perch).

*Cheilodactylus gibbosus* Cast., P.Z.S., Viet., i, 1872, p. 75 (not Rich.).

*Chilodactylus vizonarius* Kent, P.R.S., Tasm., 1887, p. xxx, 48.

Fig. 185. *Goniistius vizonarius*.

*Chilodactylus bizonarius* Kent, Nat. in Aust., 1897, p. 165, 166, pl. xxviii, fig. 13.  
*Goniistius vizonarius* McCull., Endeavour Res., i, 1911, p. 64, pl. xi.

The members of this Family may usually be recognized by the fact that the lower rays of the pectoral fin are undivided, one of which is more or less elongated.

**DACTYLOPAGRUS Gill, 1862 (carponemus).**

**DACTYLOPAGRUS CARPONEMUS Cuvier & Valenciennes (Sea-carp).**

*Cichla macroptera* Bl. & Schn., Syst. Ichth., 1801, p. 342 (not Forst.).  
*Cheilodactylus carponemus* Cuv. & Val., Hist. Nat. Poiss., v, 1830, p. 362, pl. cxxviii; McCoy, Prod. Zool. Viet., dec. xviii, 1889, pl. clxxiii, clxxiv.

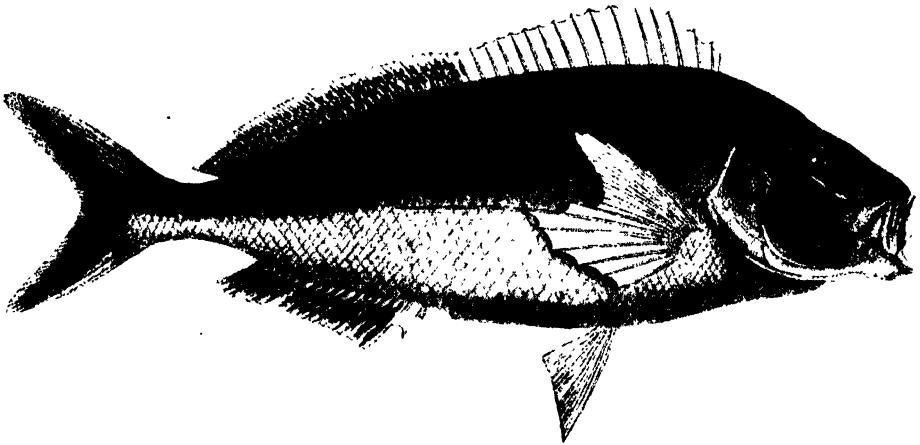


Fig. 186. *Dactylopagrus carponemus*.

It may be noted that references to *D. carponemus* from Eastern Australia are applicable to *D. morrowi* Rams. & Ogil.

**DACTYLOPAGRUS MACROPTERUS Forster (Jackass Fish).**

*Sciaena macroptera* Forst., in Bl. & Schn., Syst. Ichth., 1801, p. 342.  
*Cheilodactylus macropterus* Rich., P.Z.S., 1850, p. 62; Ogil., Edib. Fish. N.S.W., 1893, p. 57; Ribeiro, Arch. Mus. Nac. Rio Jan., xvii, 1915, Chilod. p. 2, pl. *Dactylosparus macropterus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 32; McCull., Endeavour Res., i, 1911, p. 66, pl. xii.

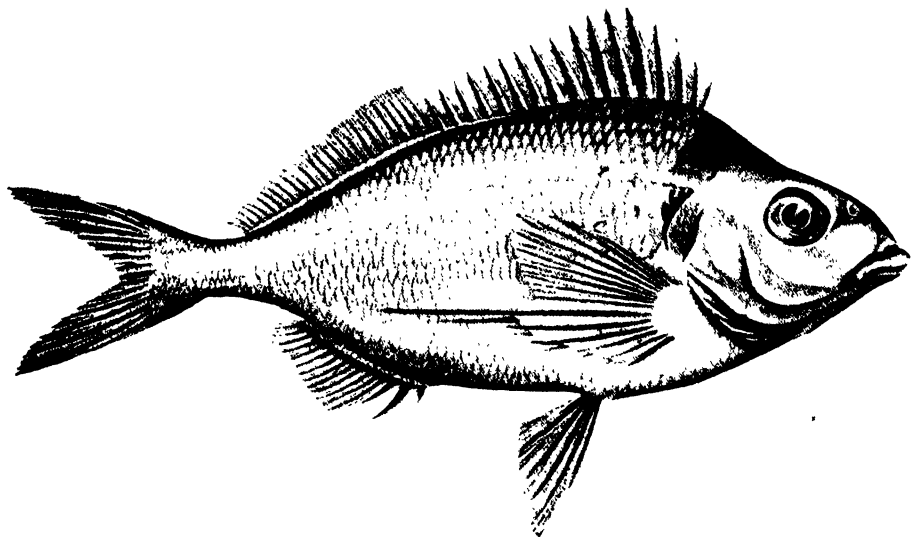


Fig. 187. *Dactylopagrus macropterus*.

Seldom seen here, but one of the commonest food fishes of New Zealand, where it is called The Tarakihi. The name Jackass Fish is in allusion to the cross on the nape.

**DACTYLOPHORA** De Vis, 1883 (semimaculata=*nigricans*).

**DACTYLOPHORA NIGRICANS** Richardson (Strong Fish, Tillywurti).

*Cheilodactylus nigricans* Rich., P.Z.S., 1850, p. 63.

*Chilodactylus nebulosus* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 26; Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1078, pl. ii, fig. 1.

*Dactylophora semimaculata* De Vis, P.L.S., N.S.W., viii, 1883, p. 284.

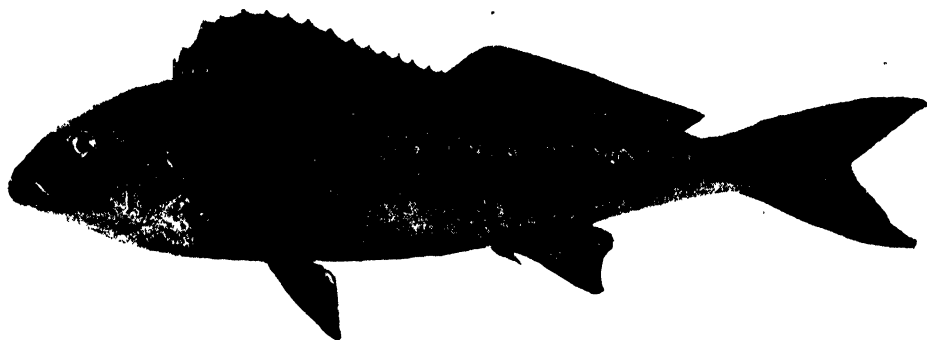


Fig. 188. *Dactylophora nigricans*.

*Psilocranium corii* and *P. nigricans* Mael., P.L.S., N.S.W., viii, 1884, p. 440, 441, pl. xxii.

*Dactylophora nigricans* McCull., Rec. W.A. Mus., i, 1914, p. 217 (syn.).

The best known of our Sea-carps; esteemed as food and reaching a length of about 3 feet.

**THREPTERIUS** Richardson, 1850 (*maculosus*).

**THREPTERIUS MACULOSUS** Richardson.

*Threpterus maculosus* Rich., P.Z.S., 1850, p. 70, pl. ii, fig. 1, 2.

*Chironemus maculosus* Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 78.

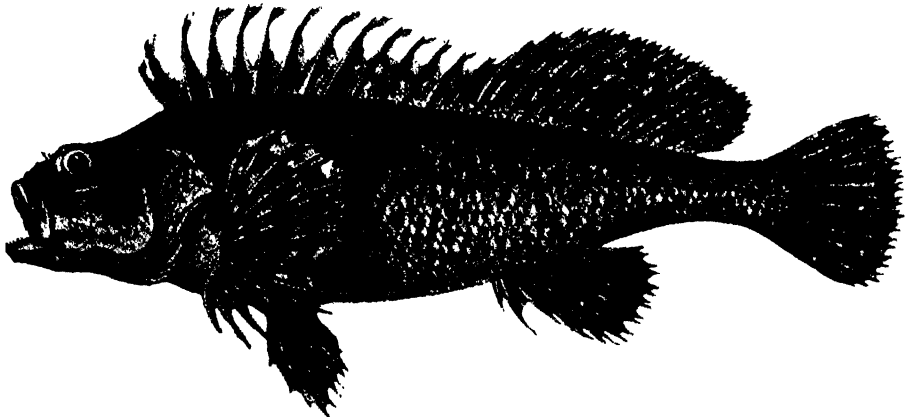


Fig. 189. *Threpterus maculosus*.

## FAMILY LATRIDIDAE.

**LATRIDOPSIS** Gill, 1862 (*ciliaris*).

**LATRIDOPSIS FORSTERI** Castelnau (Silver Trumpeter).

*Latris forsteri*, *L. bilineata* and *L. inornata* Cast., P.Z.S., Vict., i, 1872, p. 77, 79.

?*Latris ramsayi* Ogil., P.L.S., N.S.W., x, 1885, p. 229.

*Latris ciliaris* Waite, Mem. Aust. Mus., iv, 1899, p. 85; Stead, Edib. Fish. N.S.W., 1908, p. 70, pl. xxxix (not Forst.).

*Latridopsis forsteri* McCull., Endeavour Res., iii, 1915, p. 146, pl. xxvii.

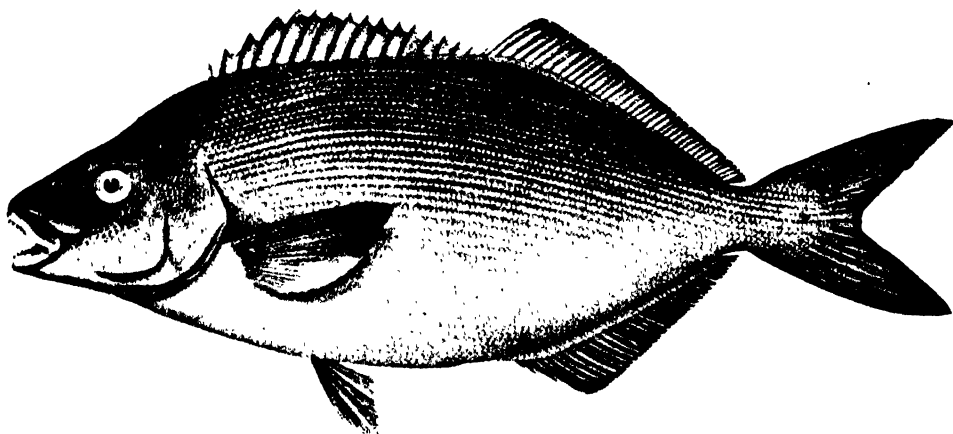


Fig. 190. *Latridopsis forsteri*.

A near relative of the famed "Hobarttown Trumpeter," though not equal to that fish in economic value.

DIVISION POMACENTRIFORMES.

FAMILY POMACENTRIDAE.

**PARMA** Günther, 1862 (*microlepis*).

**PARMA MICROLEPIS** Günther (Puller).

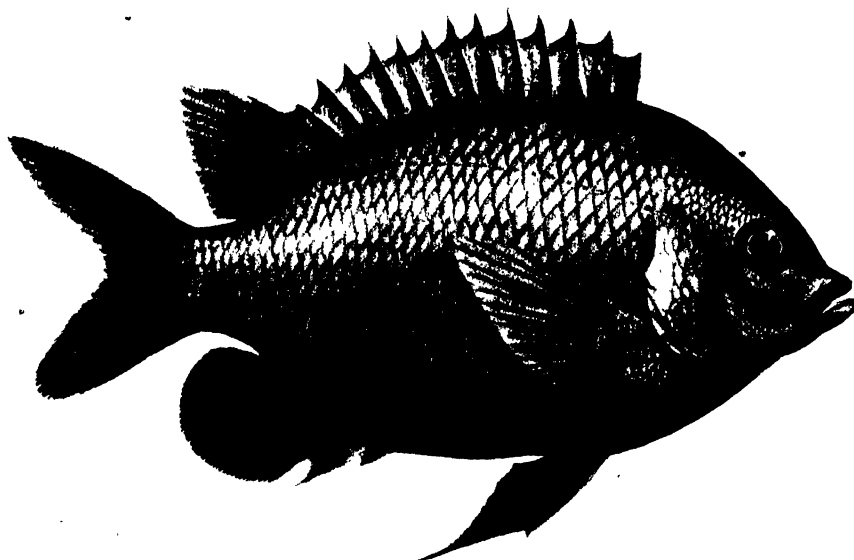


Fig. 191. *Parma microlepis*.

*Glyphisodon biocellatus* Benn., P.Z.S., 1859, p. 222, pl. ix, fig. A (not Cuv. & Val.).

*Parma microlepis* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 57; Stead, Edib. Fish. N.S.W., 1908, p. 81, pl. 1.

*Parma squamipinnis* Günth., *op. cit.*, p. 58, 505.

?*Glyphidodon australis* Steind., Sitzb. Akad. Wiss. Wien, lvi, 1867, p. 328.

*Glyphidodon brownriggii* Waite, P.L.S., N.S.W. (2), ix, 1894, p. 219 (not Benn.).

*Hypsipops microlepis* Waite, Rec. Aust. Mus., vi, 1905, p. 67, pl. xii.

**GLYPHISODON** Lacepède, 1803 (moucharra).

**GLYPHISODON VICTORIAE** Günther (Scaly-fin).

*Glyphidodon victoriae* Günth., A.M.N.H. (3), xi, 1863, p. 115.

*Heliastes lividus* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 36.

*Glyphisodon victoriae* McCull. & Waite, Rec. S.A. Mus., i, 1918, p. 46, pl. ii, fig. 2.

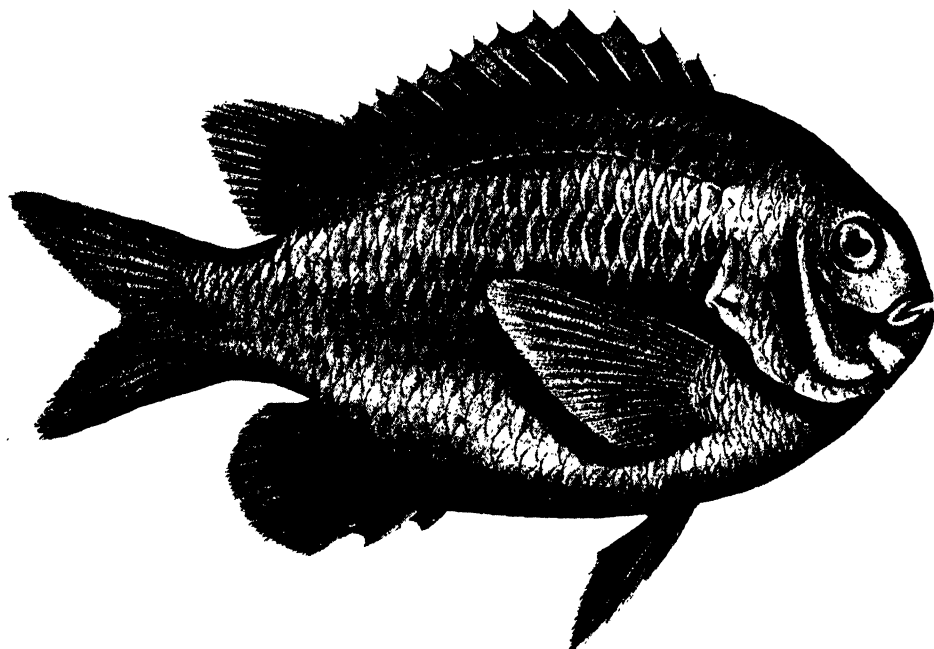


Fig. 192. *Glyphisodon victoriae*.



## DIVISION LABRIFORMES.

## FAMILY LABRIDAE.

**PSEUDOLABRUS** Bleeker, 1862 (*rubiginosus*).**PSEUDOLABRUS PSITTACULUS** Richardson.

*Labrus psittaculus* Rich., P.Z.S., 1840, p. 26 and Zool. Ereb. & Terr., 1848, p. 129, pl. lvi, fig. 7-10.

*Labrichthys psittacula* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 114.

*Labrichthys rubicunda* Maccl., P.L.S., N.S.W., vi, 1881, p. 89.

*Labrichthys mortonii* Johnston, P.R.S., Tasm., 1885, p. 256.

*Pseudolabrus psittaculus* McCull., Endeavour Res., i, 1911, p. 77, fig. 19.

*Pseudolabrus miles* McCull., Rec. Aust. Mus., ix, 1913, p. 372 (not Bl. & Schn.).

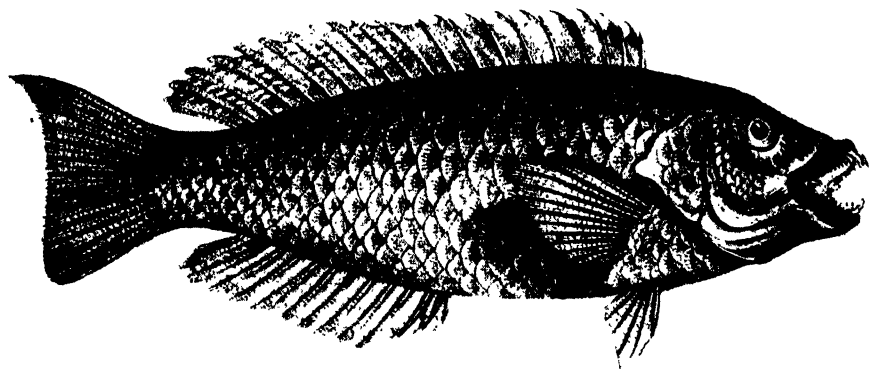


Fig. 193. *Pseudolabrus psittaculus*.

Members of this genus are called Parrot-fishes. Being of herbivorous habit, they do not keep well and are not valued as food.

**PSEUDOLABRUS FUCICOLA** Richardson.

*Labrus fucicola* Rich., P.Z.S., 1840, p. 26 and Zool. Ereb. & Terr., 1848, p. 127, pl. liv, fig. 1, 2.

*Labrichthys fucicola* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 112 (footnote).

*Labrichthys bothryocosmos* Hutt., Cat. Fish. N.Z., 1872, p. 43, pl. vii, fig. 68 (not Rich.).

*Pseudolabrus fucicola* Gill, Mem. Nat. Acad. Sci., vi, 1893, p. 116; McCull., Rec. Aust. Mus., ix, 1913, p. 374, pl. xviii.

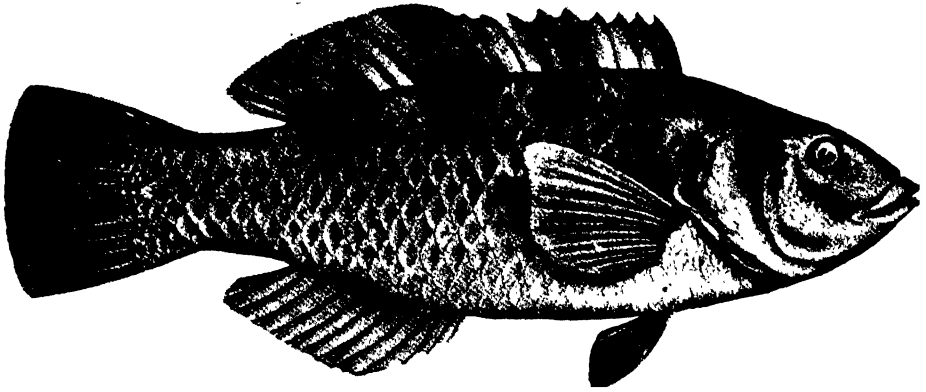


Fig. 194. *Pseudolabrus fucicola*.

### **PSEUDOLABRUS CELIDOTUS Forster.**

*Labrus celidotus* Forst., in Bl. & Schm., Syst. Ichth., 1801, p. 265; Rich., Zool. Ereb. & Terr., 1848, p. 53, pl. xxxi, fig. 1-5.

*Labrus poecilopleura* Cuv. & Val., Hist. Nat. Poiss., xiii, 1839, p. 95.

*Julis? notatus* Rich., A.M.N.H., xi, 1843, p. 425.

*Labrus botryocosmus* Rich., Zool. Ereb. & Terr., 1848, p. 53, pl. xxxi, fig. 6-10.

*Labrichthys celidota* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 113.

*Pseudolabrus celidotus* Gill, Mem. Nat. Acad. Sci., vi, 1893, p. 98, 117.

*Labrichthys bothryocosmus* Günth., *op. cit.*, p. 114; Hutt., T.N.Z. Inst., v, 1873, p. 265, pl. x, fig. 68.

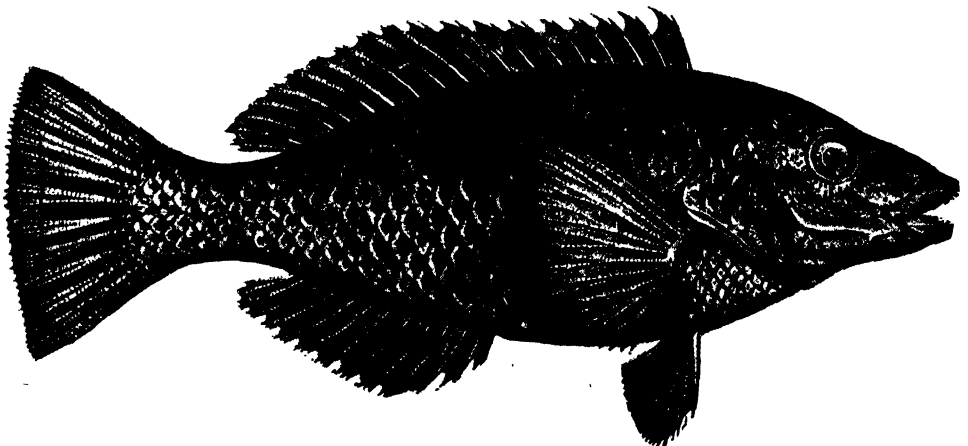


Fig. 195. *Pseudolabrus celidotus*.

**PSEUDOLABRUS AURANTIACUS** Castelnau.

*Cheilinus aurantiacus* Cast., P.Z.S., Viet., i, 1872, p. 245.

*Labrichthys elegans* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 195 and Sitzb.

Akad. Wiss. Wien, lxxxviii, 1884, p. 1102, pl. vi, fig. 2 (male), 3 (female).

*Pseudolabrus elegans* Gill, Proc. U.S. Nat. Mus., xiv, 1892, p. 403.

*Pseudolabrus aurantiacus* McCull. & Waite, Rec. S.A. Mus., i, 1918, p. 47.

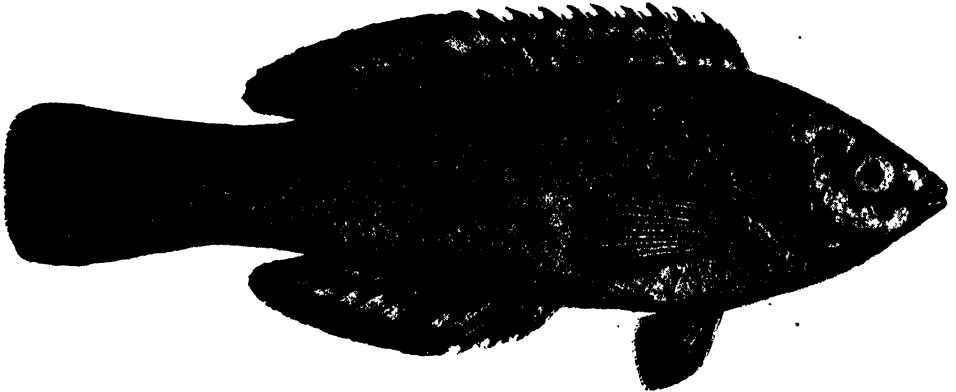


Fig. 196. *Pseudolabrus aurantiacus*.

**PSEUDOLABRUS TETRICUS** Richardson.

*Labrus tetricus*-Rich., P.Z.S., 1840, p. 25 and Zool. Ereb. & Terr., 1848, p. 126, pl. lv, fig. 1-4.

*Labrichthys ephippium* Günth., A.M.N.H. (3), xi, 1863, p. 116 (not Cuv. & Val.).

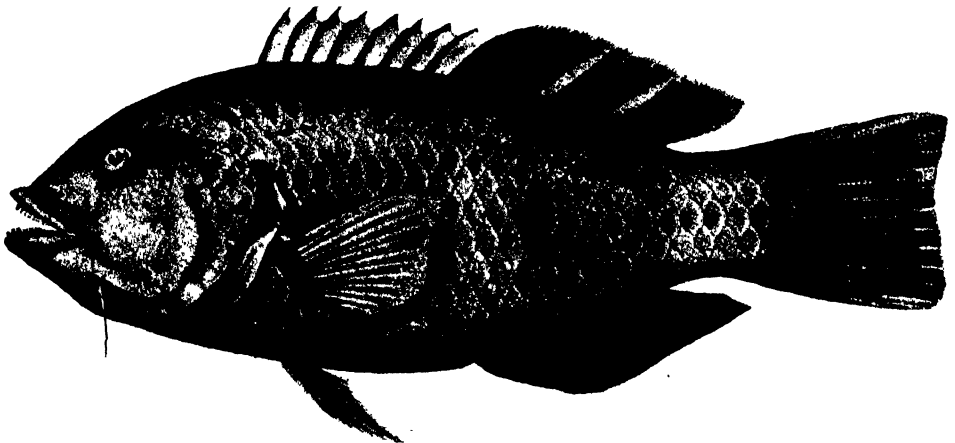


Fig. 197. *Pseudolabrus tetricus*.

*Labrichthys tetrica* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 37 (with var. *tigripinnis* and *fuscipinnis*) and Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 401 (with var. *ocellata*).

*Labrichthys richardsoni* and *L. vestita* Cast., P.Z.S., Viet., i, 1872, p. 150, 151.

*Labrichthys bleekeri* Cast., *op. cit.*, p. 148; McCoy, Prod. Zool. Viet., dec. xiv, 1887, pl. exxxiv.

?*Labrichthys cuvieri* Cast., *op. cit.*, ii, 1873, p. 53.

*Labrichthys cyanogenys* Rams. & Ogil., P.L.S., N.S.W. (2), ii, 1887, p. 242.

*Pseudolabrus cyanogenys* Gill, P.U.S. Nat. Mus., xiv, 1891, p. 403; McCull., Endeavour Res., i, 1911, p. 76, pl. xiii.

### **PSEUDOLABRUS PUNCTULATUS** Günther.

*Labrichthys punctulata* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 118.

*Labrichthys edelensis* Cast., P.Z.S., Viet., ii, 1873, p. 137.

*Pseudolabrus punctulatus* Gill, P.U.S. Nat. Mus., xiv, 1892, p. 401; Waite, Rec. Aust. Mus., vi, 1905, p. 69, pl. xiii.

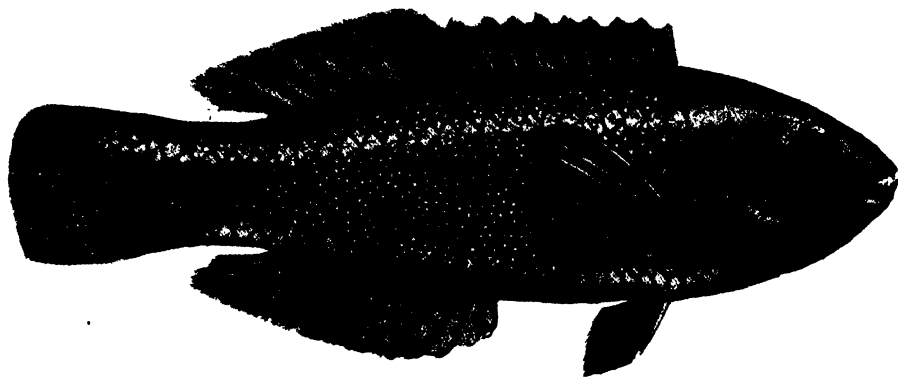


Fig. 198. *Pseudolabrus punctulatus*.

### **PSEUDOLABRUS MACLEAYI** Herzenstein.

*Labrichthys macleayi* Herz., Ann. Mus. Zool. St. Petersburg, i, 1896, p. 10.

### **PICTILABRUS** Gill, 1891 (*latioclavius*).

#### **PICTILABRUS LATICLAVIUS** Richardson (Senator Fish).

*Labrus latioclavius* Rich, P.Z.S., 1839, p. 99, and Zool. Ereb. & Terr., 1848, p. 128, pl. lvi, fig. 3-6.

*Labrichthys laticlavius* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 115, 507;

McCoy, Prod. Zool. Viet., dec. xvii, 1888, pl. clxiii.

*Labrichthys labiosa* MacL., P.L.S., N.S.W., vi, 1881, p. 88, pl. i, fig. 2.

*Pictilabrus laticlavius* Gill, P.U.S. Nat. Mus., xiv, 1892, p. 403.

*Pseudolabrus laticlavius* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 39.

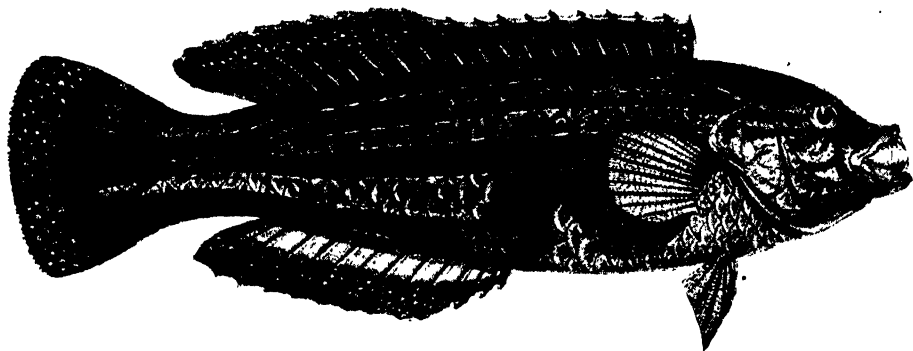


Fig. 200. *Pictilabrus laticlavius*.

**AUSTROLABRUS Steindachner, 1884 (maculatus).**

**AUSTROLABRUS MACULATUS Macleay.**

*Labrichthys maculata* MacL., P.L.S., N.S.W., vi, 1881, p. 89 (not De Vis).

*Austrolabrus maculatus* Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1100, pl. v (male) and vi fig. 1 (female); McCull., Rec. Aust. Mus., ix, 1913, p. 367, pl. xvi.

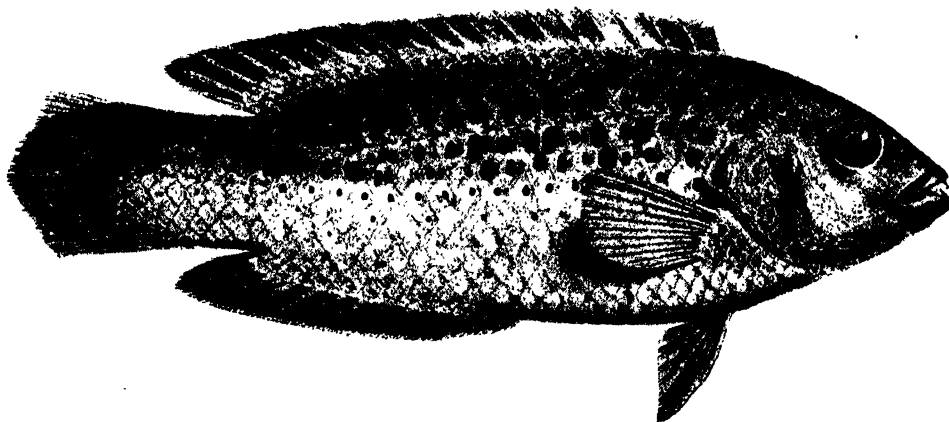


Fig. 201. *Austrolabrus maculatus*.

**THALLIURUS Swainson, 1839 (blochi).**

**THALLIURUS BLEASDALEI Castelnau.**

*Hemigymnus bleasdalei* Cast., Res. Fish. Aust., 1875, p. 38.

**OPHTHALMOLEPIS Bleeker, 1861 (lineolatus).**

**OPHTHALMOLEPIS LINEOLATUS Cuvier & Valenciennes (Maori).**

*Julis lineolatus* Cuv. & Val., Hist. Nat. Poiss., xiii, 1839, p. 436.

*Julis cyanogramma* Rich., A.M.N.H. (2), vii, 1851, p. 289.

*Ophthalmolepis lineolata* Bleek., P.Z.S., 1861, p. 413; Roughley, Fish. Aust., 1916, p. 157, pl. liv; Kner, Reise Novara, 1865, p. 258, pl. xi.

*Coris lineolata* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 206; Ogil., Edib. Fish. N.S.W., 1893, p. 142; Stead, Edib. Fish. N.S.W., 1908, p. 84, pl. liv.

*Julis adelaidensis* Cast., Res. Fish. Aust., 1875, p. 35.

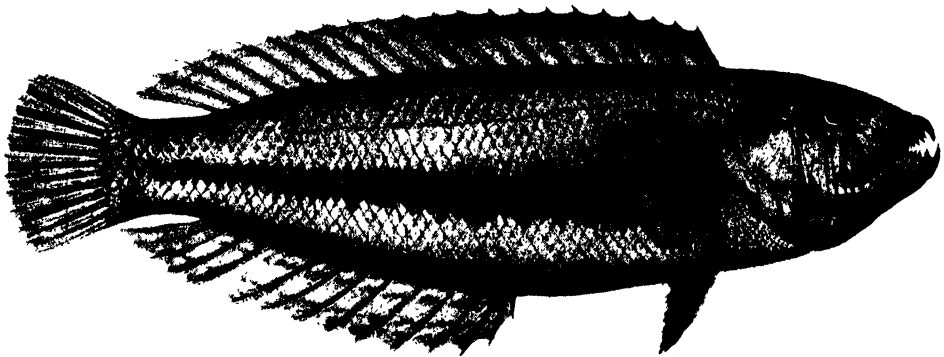


Fig. 203. *Ophthalmolepis lineolatus*.

As food, superior to the Parrot-fishes.

**ACHOERODUS Gill, 1863 (gouldii).**

**ACHOERODUS GOULDII Richardson (Groper).**

*Labrus gouldii* Rich., A.M.N.H., xi, 1843, p. 353.

*Cossyphus gouldii* Rich., Zool. Ereb. & Terr., 1848, p. 132 and P.Z.S., 1850, p. 72, pl. iii, fig. 3; Ten. Woods, Fish. N.S.W., 1883, p. 74, pl. xxxi.

*Achoerodus gouldi* Gill, Proc. Acad. Nat. Sci. Phil., xv, 1863, p. 222; Roughley, Fish. Aust., 1916, p. 147, pl. xlviii (Blue form) and xlix (Red form).

*Platychoerops muelleri* Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 399, pl. viii, fig. 2.

*Platychoerops gouldi* Ogil., Edib. Fish. N.S.W., 1893, p. 132, pl. xxxv.

*Platychoerops badius* Ogil., *op. cit.*, p. 131.

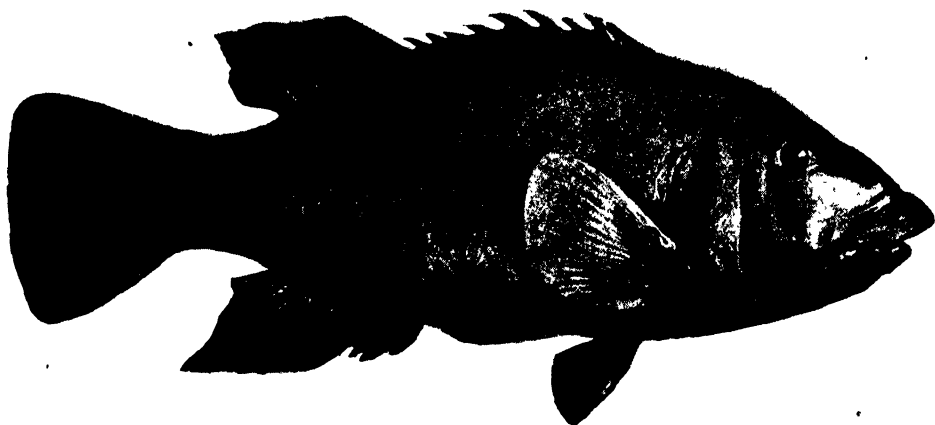


Fig. 204. *Achoerodus gouldii*.

Two colour varieties occur, respectively known as Blue and Red Gropers. Attains a length of 3½ feet and a weight of 40 lb. Not greatly favoured as food.

## FAMILY ODACIDAE.

**ODAX** Cuvier, 1829 (pullus).

**ODAX RADIATUS** Quoy & Gaimard.

*Malacanthus radiatus* Quoy & Gaim., Voy Astrolabe, Zool., iii, 1835, p. 717, pl. xix, fig. 2.

*Cheilio lineatus* Cuv. & Val., Hist. Nat. Poiss., xiii, 1839, p. 354.

*Odar lineatus* Rich., Zool. Ereth. & Terr., 1848, p. 133, pl. lx, fig. 1-5.

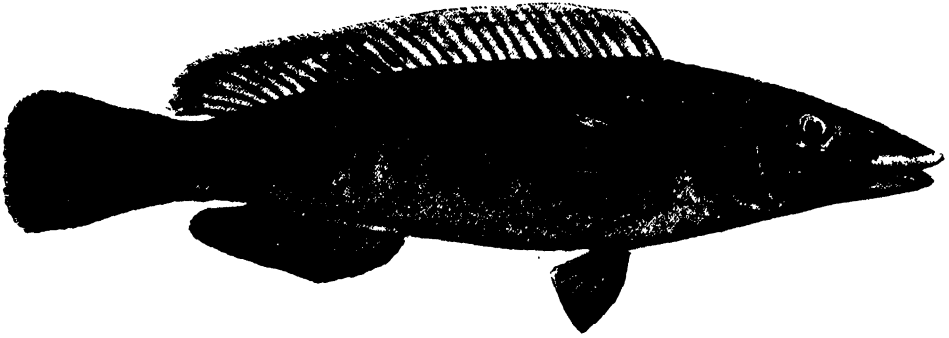
*Odar radiatus* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 242.

**ODAX RICHARDSONII** Günther (Rock Whiting).

*Odar pullus* Cuv. & Val., Hist. Nat. Poiss., xiv, 1839, p. 304, pl. ccccviii, fig. 1 (not Forst.).

*Odar richardsonii* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 241; Roughley, Fish. Aust., 1916, p. 159, pl. lv; Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 404; Ogil., Edib. Fish. N.S.W., 1893, p. 143, pl. xxxvi; Stead, Edib. Fish. N.S.W., 1908, p. 85, pl. lv.

*Odar hyrtlil* Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 464.

Fig. 206. *Odax richardsonii*.

The Rock Whitings have no affinities with members of the Family *Sillaginidae*; the respective food values are not comparable.

**ODAX FRENATUS** Günther.

*Odax frenatus* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 241.

**ODAX PUSILLUS** Castelnau.

*Odax pusillus* Cast., P.Z.S., Viet., ii, 1873, p. 72.

**ODAX WATERHOUSII** Castelnau.

*Neodax waterhousei* Cast., Res. Fish. Aust., 1875, p. 37.

*Odax waterhousei* Mael., P.L.S., N.S.W., vi, 1881, p. 109.

**OLISTHOPS** Richardson, 1850 (cyanomelas).

**OLISTHOPS CYANOMELAS** Richardson (Herring Cale).

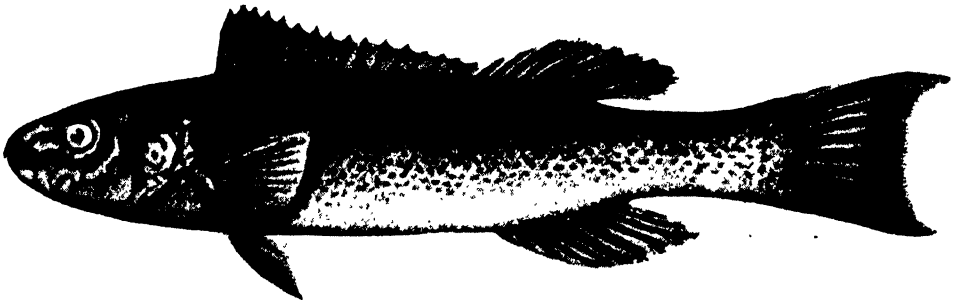
*Olisthops cyanomelas* Rich., P.Z.S., 1850. p. 75, pl. iii, fig. 1, 2; Ogil., Edib. Fish.

N.S.W., 1893, p. 145; Stead, Edib. Fish. N.S.W., 1908, p. 85, pl. lvi; McCull.,

Rec. Aust. Mus., xiii, 1920, p. 69, pl. xiv, fig. 3.

*Olistherops brunnescus* Mael., P.L.S., N.S.W., iii, 1878, p. 36, pl. v, fig. 1.

*Olistherops brownii* Johnst., P.R.S., Tasm., 1884, p. 193.

Fig. 210. *Olisthops cyanomelas*.



**SIPHONOGNATHUS** Richardson, 1857 (argyrophanes).

**SIPHONOGNATHUS ARGYROPHANES** Richardson (Tube-mouth).

*Siphonognathus argyrophanes* Rich., P.Z.S., 1857, p. 238, pl. vi.



Fig. 211. *Siphonognathus argyrophanes*.

Lives among seaweed; of no economic value.

## FAMILY SCARIDAE.

**PSEUDOSCARUS** Bleeker, 1861 (microrhinos).

**PSEUDOSCARUS MODESTUS** Castelnau.

*Pseudoscarus modestus* Cast., Res. Fish. Aust., 1875, p. 41.

Members of the Families *Odacidae* and *Scaridae* differ from those of the *Labridae* by having the teeth in each jaw united to form a sharp-edged plate.

**PSEUDOSCARUS DUMERILII** Castelnau.

*Pseudoscarus dumerilii* Cast., Res. Fish. Aust., 1875, p. 41.

**HETEROSCARUS** Castelnau, 1872 (filamentosus).

**HETEROSCARUS FILAMENTOSUS** Castelnau (Rainbow-fish).

*Heteroscarus filamentosus* Cast., P.Z.S., Viet., i, 1872, p. 246 and ii, 1873, p. 74;

Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1092, pl. iii, fig. 1 (male).

*Heteroscarus modestus* Cast., *op. cit.*, i, p. 246 and ii, p. 75.

?*Heteroscarus castelnaui* MacL., P.L.S., N.S.W., iii, 1878, p. 36, pl. v, fig. 2;

Steind., *op. cit.*, p. 1095, 1097, pl. iv (female) and (*H. elegans*), iii, fig. 2 (young).

?*Heteroscarus tenuiceps* De Vis, P.L.S., N.S.W., ix, 1885, p. 883.

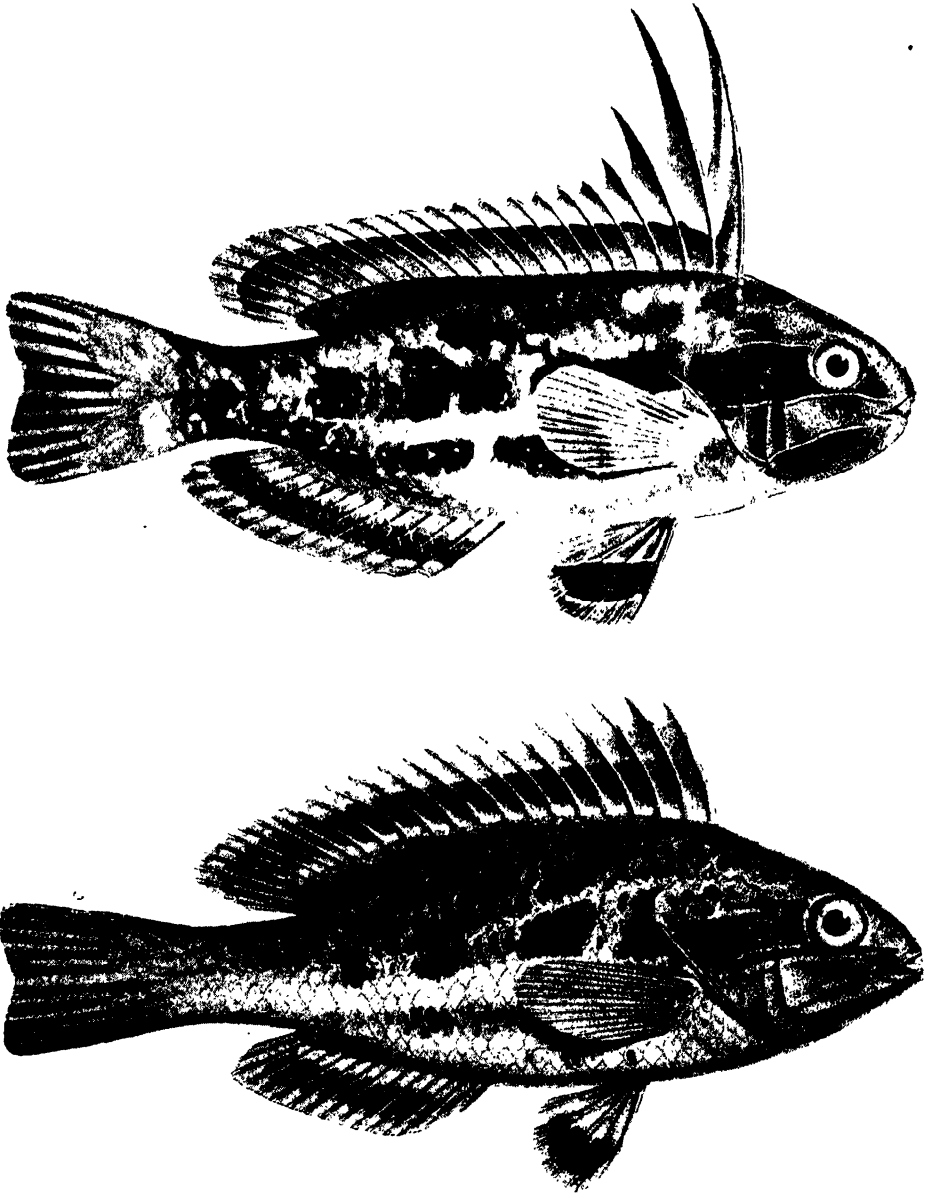


Fig. 214. *Heteroscarus filamentosus* male and female.

One of our most gorgeous fishes. Illustrated on the coloured frontispiece.

## DIVISION GADOPSIFORMES.

## FAMILY GADOPSIDAE.

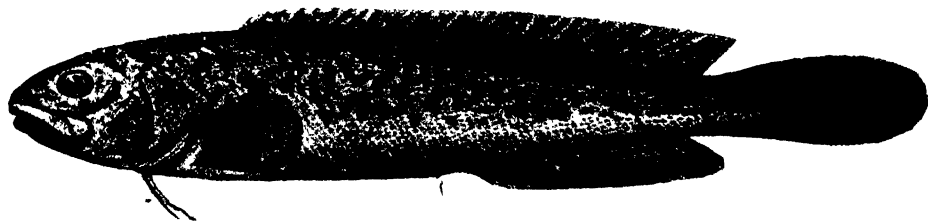
**GADOPSIS** Richardson, 1848 (*marmoratus*).**GADOPSIS MARMORATUS** Richardson (Slippery, River Blackfish).

*Gadopsis marmoratus* Rich., Zool. Erch. & Terr., 1848, p. 122, pl. lix, fig. 6 11;  
 Ogil., Edib. Fish. N.S.W., 1893, p. 149 and Mem. Qld. Mus., ii, 1913, p. 69,  
 pl. xx (syn. and econ. hist.); Stead, Edib. Fish. N.S.W., 1908, p. 116,  
 pl. lxxx.

*Gadopsis gracilis* McCoy, Prod. Zool. Viet., dec. iii, 1879, pl. xxvii, fig. 2.

*Gadopsis gibbosus* McCoy, *op. cit.*, p. 41.

*Gadopsis fuscus* Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1105, pl. i,  
 fig. 2.

Fig. 215. *Gadopsis marmoratus*.

Attains a length of 25 inches in Victoria; specimens over 10 inches are unknown in our streams.

## DIVISION TRACHINIFORMES.

## FAMILY PINGUIPEDIDAE.

**NEOPERCIS** Steindachner & Döderlein, 1884 (*ramsayi*).**NEOPERCIS RAMSAYI** Steindachner.

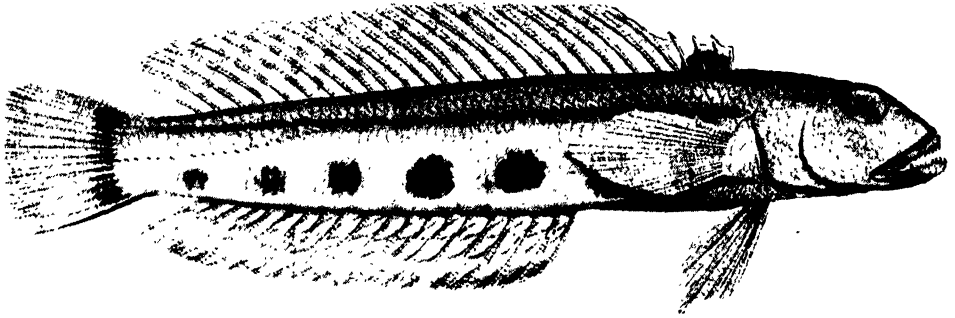
*Percis ramsayi* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 194.

*Parapercis ramsayi* Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1072.

*Percis novae-cambriae* Ogil., P.L.S., N.S.W., x, 1885, p. 228.

*Parapercis novae-cambriae* Waite, Mem. Aust. Mus., iv, 1899, p. 111, pl. xxv.

*Neopercis novae-cambriae* Waite, Rec. Aust. Mus., v, 1904, p. 237.

Fig. 216. *Neopercis ramsayi*.

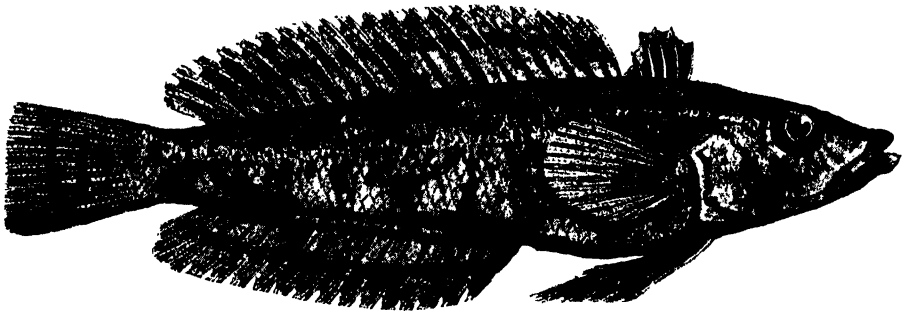
Our members of this Family are fleshy little fishes, but are not taken in sufficient numbers to be generally used as food.

#### **NEOPERCIS HAACKEI Steindachner.**

*Percis haackei* Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1070.

*Neopercis haackei* Steind. & Döder., Denk. Akad. Wiss. Wien, xlix, 1884, p. 212.

*Parapercis haackei* McCull., Endeavour Res., ii, 1914, p. 155, pl. xxxiv, fig. 2.

Fig. 217. *Neopercis haackei*.

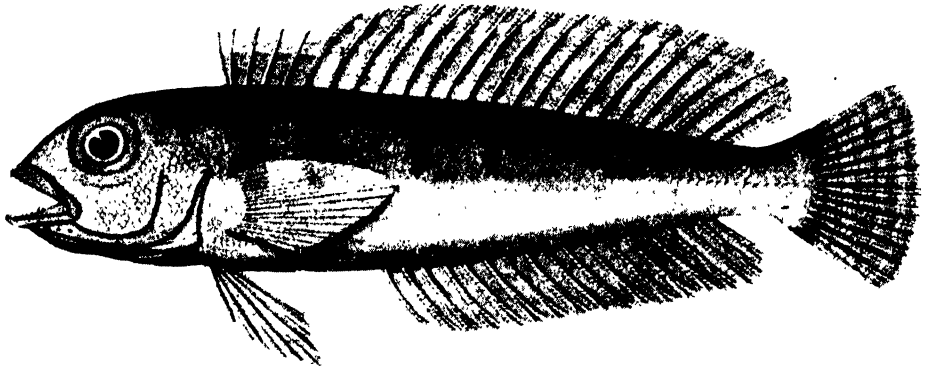
#### **NEOPERCIS ALLPORTI Günther.**

*Percis allporti* Günth., A.M.N.H. (4), xvii, 1876, p. 394.

*Parapercis ocellaris* Waite, Mem. Aust. Mus., iv, 1899, p. 109, pl. xxiv.

*Neopercis allporti* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 50.

*Parapercis allporti* McCull., Endeavour Res., ii, 1914, p. 157.

Fig. 218. *Neopercis allporti*.

## FAMILY URANOSCOPIDAE.

**KATHETOSTOMA** Günther, 1860 (*laeve*).**KATHETOSTOMA LAEVE** Bloch & Schneider (*Stone-lifter*).*Uranoscopus laevis* Bl. & Schn., Syst. Ichth., 1801, p. 47, pl. viii.*Kathetostoma laeve* Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 231; Stead, Fish. Aust., 1906, p. 206, pl. viii; Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 471, pl. xiii, fig. 3 (head).Fig. 219. *Kathetostoma laeve*.

The repulsive appearance of the Stone-lifters militates against their popularity as food.

**KATHETOSTOMA NIGROFASCIATUM** Waite & McCulloch (Banded Stone Lifter).

*Kathetostoma nigrofasciatum* Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 469, pl. xiii, fig. 1, 2.

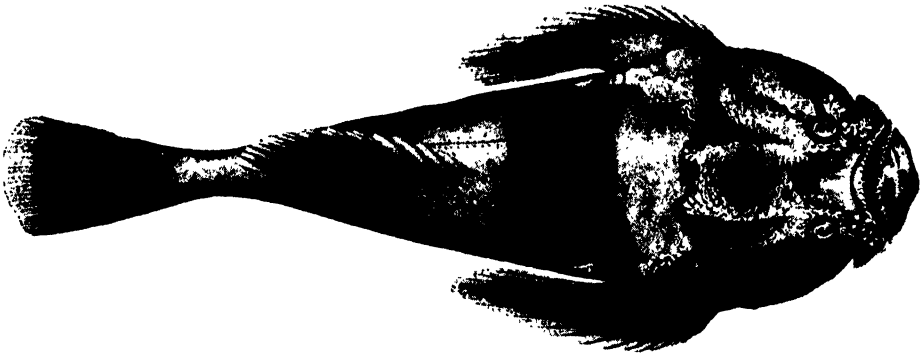


Fig. 220. *Kathetostoma nigrofasciatum*.

DIVISION NOTOTHEINIIFORMES.

FAMILY BOVICHTHYIDAE.

**PSEUDAPHRITIS** Castelnau, 1872 (*bassii*=*urvillii*).

**PSEUDAPHRITIS URVILLII** Cuvier & Valenciennes (Congoilli).

*Aphritis urvillii* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 484, pl. cexliiii.

*Pseudaphritis bassii* Cast., P.Z.S., Viet., i, 1872, p. 92.

*Aphritis bassi* Ogil., Rec. Aust. Mus., i, 1890, p. 68.

*Pseudaphritis urvillii* Ogil., P.L.S., N.S.W., xxii, 1898, p. 560.

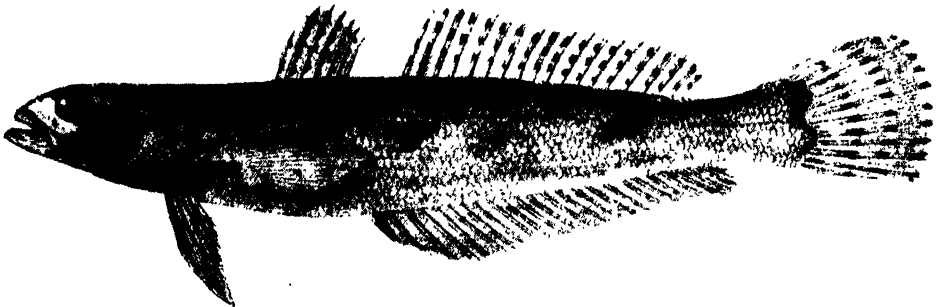


Fig. 221. *Pseudaphritis urvillii*.

Occurs in our estuarine rivers in both salt and fresh water. It reaches a length of 14 inches and is a fairly well-flavoured table fish.

**BOVICHTHYS** Cuvier & Valenciennes, 1831 (diacanthus).  
(Originally written *Bovichthus*.)

**BOVICHTHYS VARIEGATUS** Richardson.

*Bovichthus variegatus* Rich., Zool. Ereb. & Terr., 1846, p. 56, pl. xxxiv, fig. 1-4.



Fig. 222. *Bovichthus variegatus*.

DIVISION CALLIONYMIFORMES.

FAMILY CALLIONYMIDAE.

**CALLIONYMUS** Linnaeus, 1758 (lyra).

**CALLIONYMUS CALAUROPOMUS** Richardson (Stink-fish).

*Callionymus calauropomus* Rich., Zool. Ereb. & Terr., 1844, p. 10, pl. vii, fig. 4, 5; McCoy, Prod. Zool. Viet., dec. xx, 1890, pl. excii.

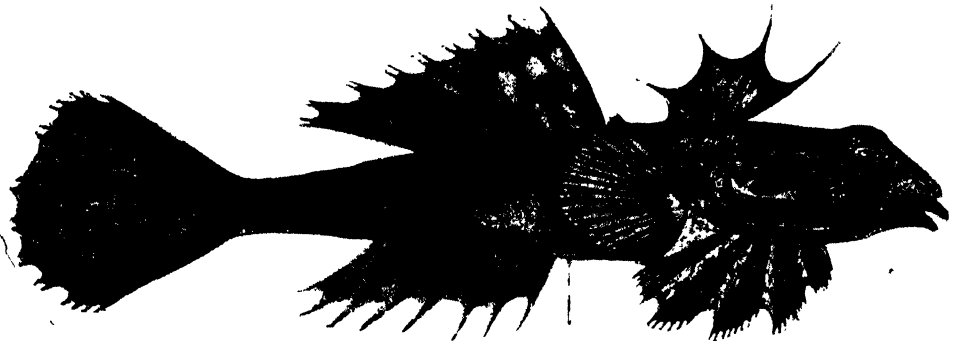


Fig. 223. *Callionymus calauropomus*.

**SUB-ORDER SCOMBROIDEA.****FAMILY SCOMBRIDAE.****THUNNUS** South, 1845 (*thynnus*).**THUNNUS THYNNUS** Linnaeus (*Tunny*).

*Scomber thynnus* Linn., Syst. Nat. (ed. x), 1758, p. 297.

*Scomber albacores* Bonnat., Encycl. Ichth., 1788, p. 120.

*Thynnus mediterraneus* Risso, Eur. Merid., iii, 1826, p. 414.

*Thynnus vulgaris*, *T. brachypterus*, *T. coretta* and *Scomber slouanci* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 58, 98, 102, 148, pl. cex, cexi.

*Thynnus maccoyii* Cast., P.Z.S., Vict., i, 1872, p. 104; Roughley, Fish. Aust., 1916, p. 164, pl. lvii.

*Thynnus thynnus* McCoy, Prod. Zool. Vict., dec. v, 1880, pl. xlv, fig. 2.

*Oreynus schlegelii* Steind. & Döder., Denk. Akad. Wiss. Wien, xlvii, 1884, p. 10, pl. iii, fig. 1.

*Albacora thynnus* Jord., Proc. Acad. Nat. Sci. Phila., 1888, p. 180.

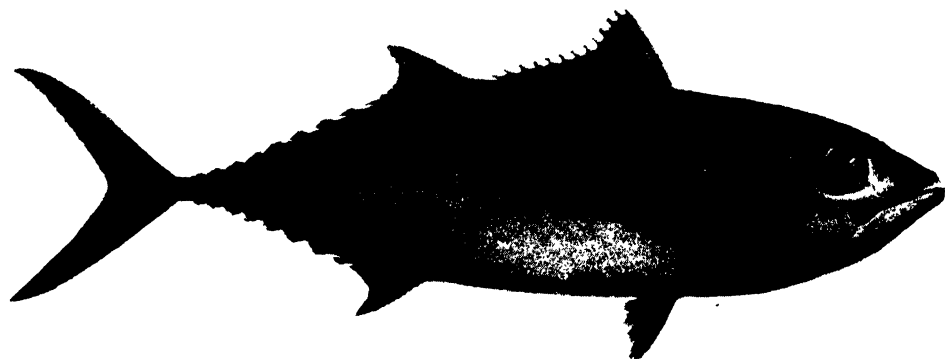


Fig. 224. *Thunnus thynnus*.

The famous Tuna of American anglers; reaches a weight of 1,500 lb. The flesh of large examples is very oily.

**SCOMBER** Linnaeus, 1758 (*scombrus*).**SCOMBER COLIAS** Gmelin (*Mackerel*).

*Scomber colias* Gmel., Syst. Nat. (ed. xiii), 1789, p. 1329; Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 39, pl. ccix; Day, Fish. Gt. Brit. & Irel., i, 1881, p. 91, pl. xxxiv; Stead, Edib. Fish. N.S.W., 1908, p. 94, pl. lxiii; Roughley, Fish. Aust., 1916, p. 162, pl. lvi.



*Scomber pneumatophorus* De la Roche, Ann. Mus. Hist. Nat., xiii, 1809, p. 315, 334; McCoy, Prod. Zool. Viet., dec. iii, 1879, pl. xxviii; Ogil., Edib. Fish. N.S.W., 1893, p. 93.

*Scomber australasicus* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 49.

*Scomber antarcticus* Cast., P.Z.S., Viet., i, 1872, p. 106.

*Pneumatophorus pneumatophorus* Jord. & Gilb., P.U.S. Nat. Mus., v, 1882, p. 593.

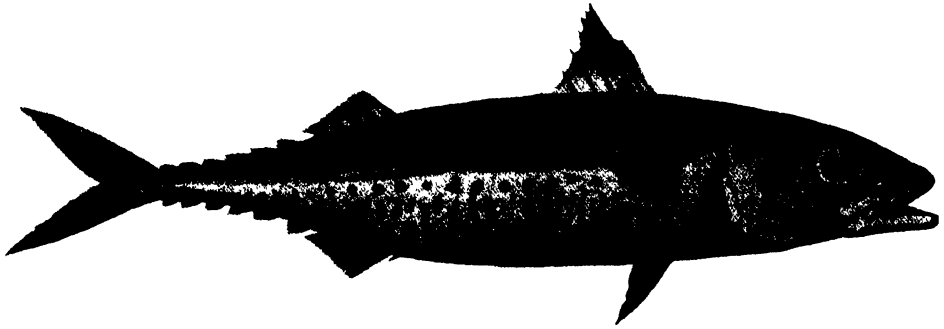


Fig. 225. *Scomber colias*.

The famous Blue-cod of New Zealand, which, in the writer's opinion, is the finest food-fish Australasia produces.

## SUB-ORDER TRICHIUROIDEA.

### FAMILY TRICHIURIDAE.

#### THYRSITES Cuvier, 1829 (atun).

#### THYRSITES ATUN Euphrasen (Barracouta).

*Scomber atun* Euphr., Vetensk. Acad. Nya Handl., xii, 1791, p. 315.

*Thyrsites atun* and *T. chilensis* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 196, 204, pl. cccix; Valenciennes, in Cuv., Règ. Anim., Ill. Poiss., 1839, pl. xlix, fig. 1;

McCoy, Prod. Zool. Viet., dec. v, 1880, pl. xlv, fig. 1.

*Thyrsites altivelis* Rich., P.Z.S., 1839, p. 99.

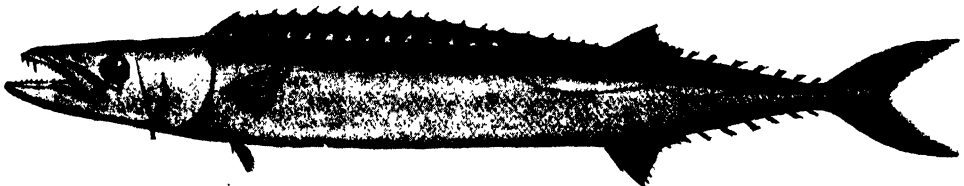


Fig. 226. *Thyrsites atun*.

The illustration is of a New Zealand specimen. Examples taken in our waters are generally infested with muscle worms and are much emaciated; in such condition they are spoken of as "axe-handles."

## SUB-ORDER XIPHIOIDEA.

### FAMILY XIPHIIDAE.

**XIPHIAS** Linnaeus, 1758 (*gladius*).

**XIPHIAS GLADIUS** Linnaeus (*Swordfish*).

*Xiphias gladius* Linn., Syst. Nat. (ed. x), 1758, p. 248; Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 255, pl. cccxv, cccxvi; Valenci., in Cuv., Règ. Anim., III. Poiss., pl. 1, lii; Day, Fish. Gt. Brit. & Irel., i, 1881, p. 146, pl. xlix. *Xiphias rondeletii* Leach, Zool. Misc., i, 1814, p. 62, pl. xxvii and Mem. Wern. Nat. Hist. Soc., ii, 1818, p. 58, pl. ii, fig. 1.

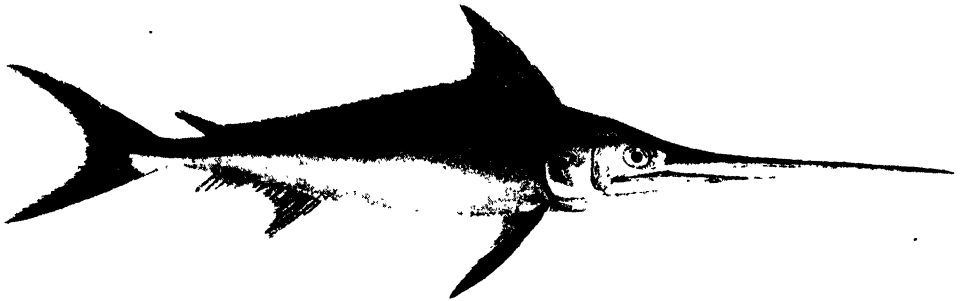


Fig. 227. *Xiphias gladius*.

The species is here determined from an imperfect skull, 4 ft. 2 in. in total length, found at Windsor, St. Vincent Gulf. The Museum possesses the sword of another example, taken at Port Augusta, Spencer Gulf; this specimen measured 14 feet in length; the species is said to attain to 15 feet. The extremely flattened sword is characteristic of this monotypic Family.

## SUB-ORDER GOBIOIDEA.

### FAMILY GOBIIDAE.

**GOBIUS** Linnaeus, 1758 (*niger*).

**GOBIUS BIFRENATUS** Kner (*Bridled Goby*, *Tarkatuki*).

*Gobius bifrenatus* Kner, Reise Novara, 1865, p. 177, pl. vii, fig. 3; Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 383; McCull. & Ogil., Rec. Aust. Mus., xii, 1919, p. 242.

*Gobius bassensis* Cast., P.Z.S., Viet., i, 1872, p. 123.

*Gobius caudatus* Cast., *op. cit.*, ii, 1873, p. 47.

?*Gobius frenatus* Zietz, T.R.S., S.A., xxvi, 1902, p. 267 (not Günth.).

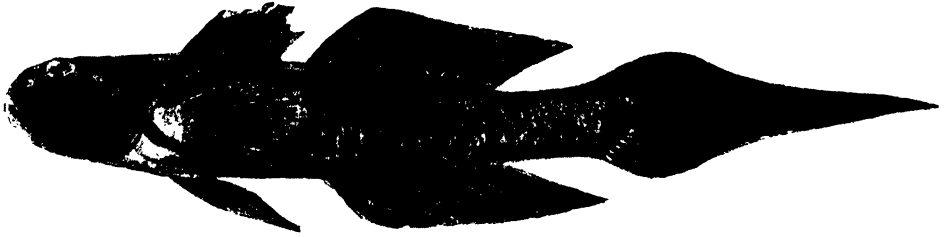


Fig. 228. *Gobius bifrenatus*.

All the Gobies are small fishes, economically used only as bait. Several species are kept in aquaria.

### **GOBIUS HINSBYI McCulloch & Ogilby.**

*Gobius pictus* Cast., P.Z.S., Viet., i, 1872, p. 124 (not Malm.).

*Gobius hinsbyi* Johnston, P.R.S., Tasm., 1903, p. x (name only); McCull. & Ogil., Rec. Aust. Mus., xii, 1919, p. 215, pl. xxxiii, fig. 1.

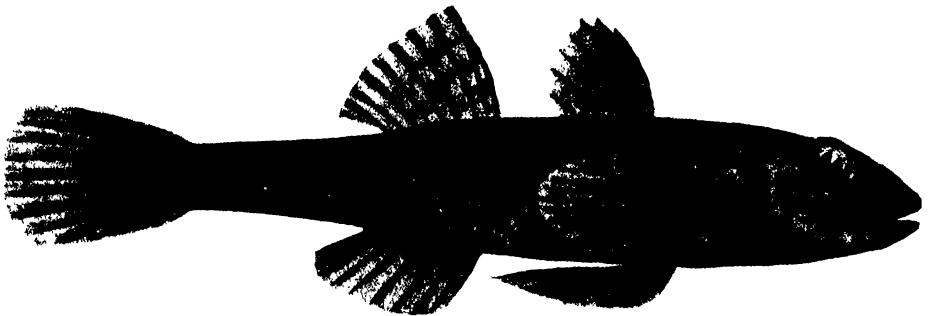


Fig. 229. *Gobius hinsbyi*.

### **GOBIUS LATERALIS Macleay.**

*Gobius lateralis* Maccl., P.L.S., N.S.W., v, 1881, p. 602.

*Rhinogobius lateralis* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 48, pl. ii, fig. 3.

*Rhinogobius lateralis* var. *obliquus* McCull. & Ogil., Rec. Aust. Mus., xii, 1919, p. 249, pl. xxxiv, fig. 4.

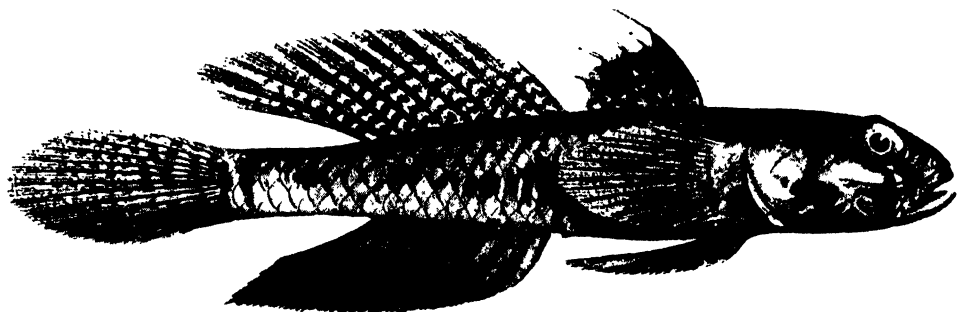


Fig. 230. *Gobius lateralis*.

**GOBIUS HAACKEI Steindachner.**

*Gobius haackei* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 194 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1074.

**GOBIUS FILAMENTOSUS Castelnau.**

*Gobius filamentosus* Cast., Res. Fish. Aust., 1875, p. 19.

**GOBIUS EREMIUS Zietz.**

*Gobius eremius* Zietz, Rep. Horn. Exped., ii, 1896, p. 180, pl. xvi, fig. 5; McCull., Rec. Aust. Mus., xi, 1917, p. 183, pl. xxxi, fig. 1.

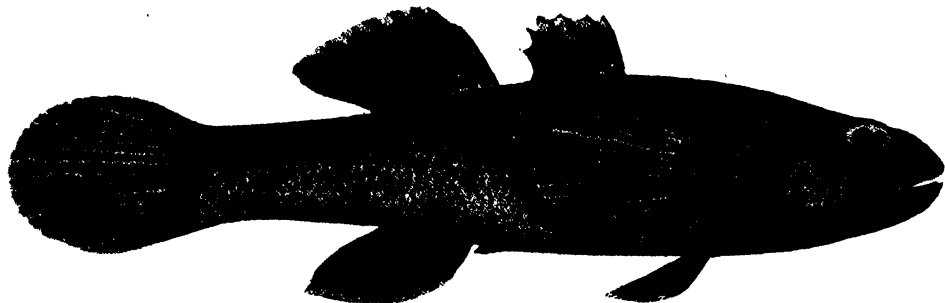


Fig. 233. *Gobius eremius*.

**VALENCIENNEA** Bleeker, 1868 (*hasselti*).**VALENCIENNEA HASSELTII** Bleeker.

*Eleotris hasselti* Bleek., Nat. Tijds. Ned. Indie., i, 1851, p. 253.

South Australian specimens are referred to a variety as below.

**var. MUCOSA** Günther.

*Gobius mucosus* Günth., P.Z.S., 1871, p. 663, pl. lxiii, fig. A.

*Gobius depressus* Rams. & Ogil., P.L.S., N.S.W. (2), i, 1886, p. 4.

*Mucogobius mucosus* McCull., Rec. W. Aust. Mus., i, 1912, p. 93.

*Callogobius hasseltii* var. *mucosus* McCull. & Ogil., Rec. Aust. Mus., xii, 1919, p. 217, pl. xxxii, fig. 4.

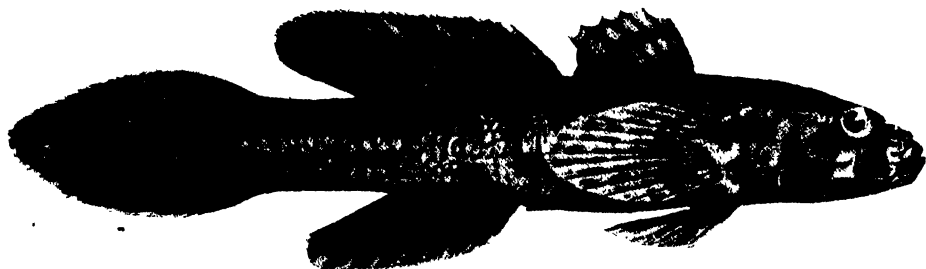


Fig 234. *Valencienna hasseltii* var. *mucosa*.

**MUGILOGOBIUS** Smitt, 1899 (*fontinalis*).**MUGILOGOBIUS GALWAYI** McCulloch & Waite (Blue-spot Goby).

*Mugilogobius galwayi* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 50, pl. iii, fig. 1.

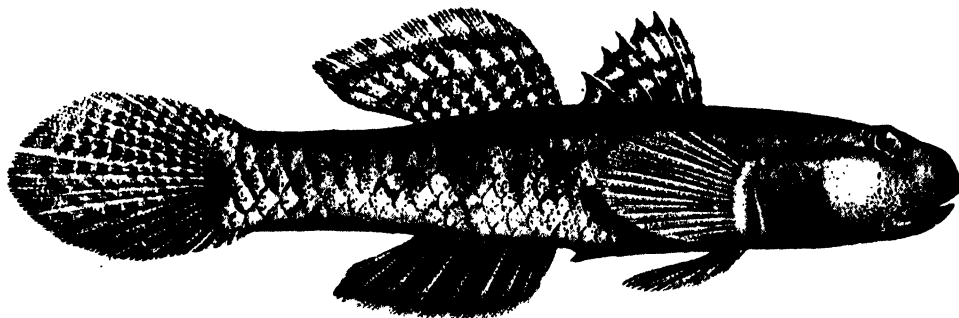


Fig. 235. *Mugilogobius galwayi*.

## FAMILY ELEOTRIDAE.

**MOGURNDA** Gill, 1863 (mogurnda).**MOGURNDA ADSPERSA** Castelnau (Chequered Gudgeon).

*Eleotris mogurnda* Bleek., Nederl. Tijdschr. Dierk., ii, 1865, p. 71 (not Rich.).

*Eleotris adspersa* Cast., P.L.S., N.S.W., iii, 1878, p. 142.

*Eleotris minus* and *E. concolor* De Vis, P.L.S., N.S.W., ix, 1884, p. 690, 692.

*Krefflius adspersus* Ogil., P.L.S., N.S.W., xxii, 1898, p. 789; Waite, Rec. Aust. Mus., v, 1904, p. 282, pl. xxv, fig. 1.

*Mogurnda mogurnda adspersus* McCull & Ogil., Rec. Aust. Mus., xii, 1919, p. 282.

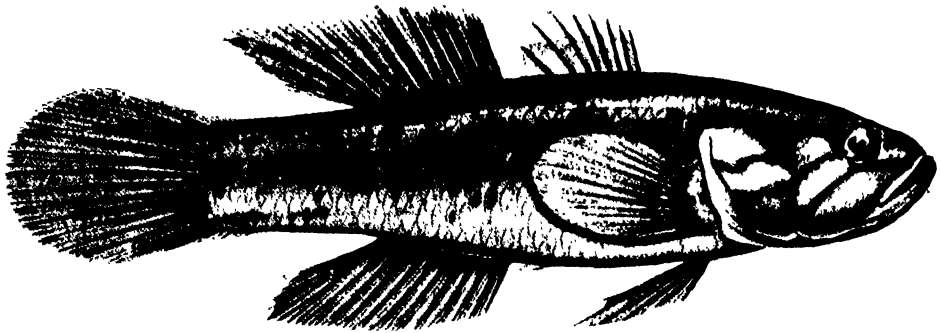


Fig. 236. *Mogurnda adspersa*.

A favourite aquarium fish, successfully introduced into America and there bred by fanciers.

**PHILYPNODON** Bleeker, 1874 (nudiceps=grandiceps?).**PHILYPNODON GRANDICEPS** Krefft (Big-headed Gudgeon).

*Eleotris grandiceps* Krefft, P.Z.S., 1864, p. 183.

*Eleotris gymnocephalus* Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 453, pl. ii, fig. 3.

?*Eleotris nudiceps* Cast., P.Z.S., Viet., i, 1872, p. 126.

*Gymnobotis gymnocephalus* Bleek., Arch. Neerl. Sci. Nat., ix, 1874, p. 304.

*Ophiorrhinus grandiceps* Ogil., P.L.S., N.S.W., xxi, 1897, p. 746.

*Ophiorrhinus angustifrons* Ogil., op. cit., xxii, 1898, p. 793.

*Philypnodon grandiceps* Waite, Rec. Aust. Mus., v, 1904, p. 285, pl. xxxvi, fig. 2.

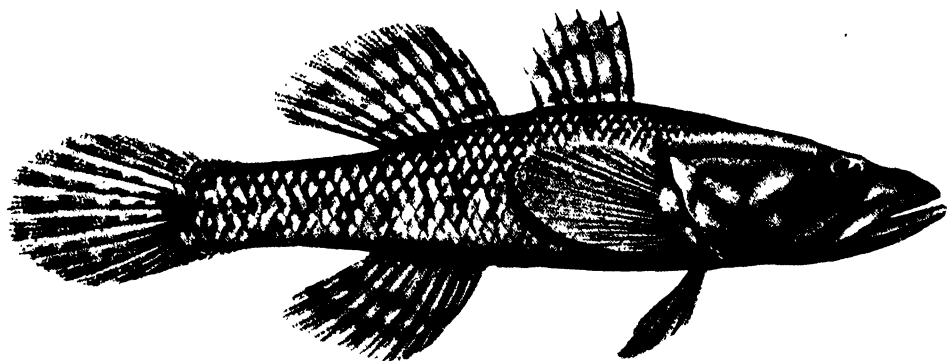


Fig. 237. *Philypnodon grandiceps*.

Not known from South Australia until this year (1921), when members of the S.A. Aquarium Society obtained examples in the River Murray billabongs.

### SUB-ORDER BLENNOIDEA.

#### FAMILY BLENNIIDAE.

**BLENNIUS** Linnaeus, 1758 (*ocellaris*).

**BLENNIUS TASMANIANUS** Richardson (Blenny).

*Blennius tasmanianus* Rich., P.Z.S., 1839, p. 99 and T.Z.S., iii, 1849, p. 129; Waite, Rec. Aust. Mus., vi, 1906, p. 295, pl. xxxvi, fig. 5.

*Blennius victoriae* Fowl., Proc. Acad. Nat. Sci. Phil., lix, 1907, p. 442, fig. 10.

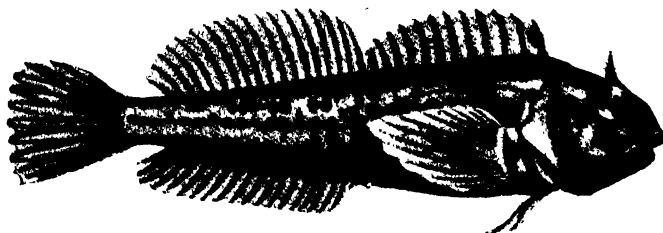


Fig. 238. *Blennius tasmanianus*.

All the Blennies are small and of no marketable value. The group is greatly in need of scientific revision.

**NEOBLENNIUS** Castelnau, 1875 (*fasciatus*).

**NEOBLENNIUS FASCIATUS** Castelnau (*Banded Blenny*).

*Neoblennius fasciatus* Cast., Res. Fish. Aust., 1875, p. 28.

**PERONEDYS** Steindachner, 1884 (*anguillaris*).

**PERONEDYS ANGUILLARIS** Steindachner.

*Peronedys anguillaris* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 197 and Sitzb.

Akad. Wiss. Wien, lxxxviii, 1884, p. 1083; McCull. & Waite, Rec. S. Aust.

Mus., i, 1918, p. 60, pl. v, fig. 2.

*Eucentronotus zietzi* Ogil., P.L.S., N.S.W., xxiii, 1898, p. 294.



Fig. 240. *Peronedys anguillaris*.

**HETEROCLINUS** Castelnau, 1872 (*adelaidae*).

**HETEROCLINUS ADELAIDAE** Castelnau.

*Heteroclinus adelaidae* Cast., P.Z.S., Vict., i, 1872, p. 247.

**OPHICLINUS** Castelnau, 1872 (*antarcticus*).

**OPHICLINUS ANTARCTICUS** Castelnau.

*Ophiclinus antarcticus* Cast., P.Z.S., Vict., i, 1872, p. 246.

*Neogunellus sulcatus* Cast., Res. Fish. Aust., 1875, p. 27.

*Ophiclinus sulcatus* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 55, fig. 28 (head).

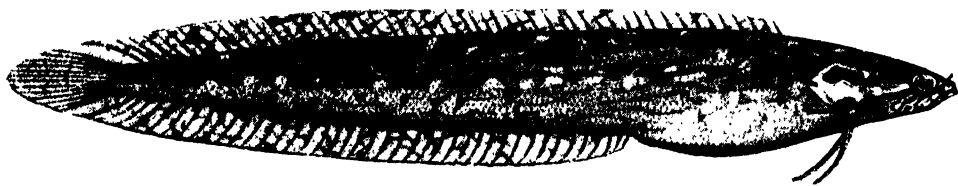
**OPHICLINUS GRACILIS** Waite.

*Ophiclinus gracilis* Waite, Res. Aust. Mus., vi, 1906, p. 207, pl. xxxvi, fig. 6.



Fig. 243. *Ophiclinus gracilis*.**OPHICLINUS PARDALIS McCulloch & Waite.**

*Ophiclinus pardalis* McCull & Waite, Rec. S. Aust. Mus., i, 1918, p. 58, pl. iv, fig. 2.

Fig. 244. *Ophiclinus pardalis*.**OPHICLINUS HOMACANTHUS Herzenstein.**

*Neogunellus homacanthus* Herz., Ann. Mus. Zool., St. Petersburg, i, 1896, p. 5.

**OPHICLINUS MICROCHIRUS Herzenstein.**

*Neogunellus microchirus* Herz., Ann. Mus. Zool., St. Petersburg, i, 1896, p. 7.

**CRISTICEPS Cuvier & Valenciennes, 1836 (australis).****CRISTICEPS AUSTRALIS Cuvier & Valenciennes (Weed Fish).**

*Cristiceps australis* Cuv. & Val., Hist. Nat. Poiss., xi, 1836, p. 402, pl. cccxxxvi;  
Lucas, P.R.S., Vict. (n.s.), iii, 1891, p. 10, pl. iii, fig. 3; McCull., Rec. Aust.  
Mus., vii, 1908, p. 39, pl. x, fig. 3.

*Christiceps splendens* Cast., P.Z.S., Vict., i, 1872, p. 244 and ii, 1873, p. 66.

*Cristiceps howittii* Cast., P.Z.S., Vict., ii, 1873, p. 48, 66.

*Cristiceps macleayi* Cast., P.L.S., N.S.W., iii, 1879, p. 385.

*Cristiceps pallidus* MacL., P.L.S., N.S.W., vi, 1881, p. 26.

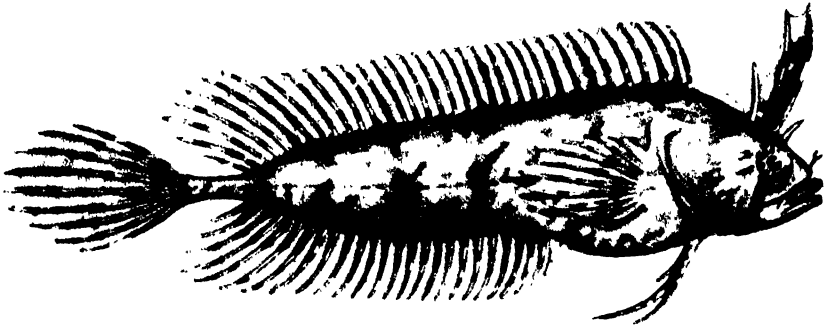


Fig. 247. *Cristiceps australis*.

**CRISTICEPS TRISTIS** Klunzinger.

*Cristiceps tristis* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 31.

**CLINUS** Cuvier, 1817 (*superciliosus*).

**CLINUS PERSPICILLATUS** Cuvier & Valenciennes.

*Clinus perspicillatus* Cuv. & Val., Hist. Nat. Poiss., xi, 1836, p. 372; McCull., Rec. Aust. Mus., vii, 1908, p. 43, pl. xi, fig. 4.

*Clinus despicillatus* Rich., Zool. Journ., 1839, p. 90 and T.Z.S., iii, 1849, p. 128, pl. vi, fig. 2.

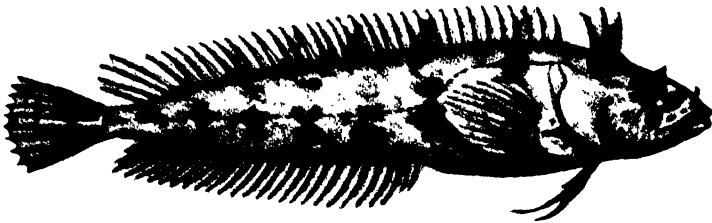


Fig. 249. *Clinus perspicillatus*.

**LEPIDOBLENNIUS** Steindachner, 1867 (*haplodactylus*).

**LEPIDOBLENNIUS MARMORATUS** Macleay.

*Tripterygium marmoratum* MacL., P.L.S., N.S.W., iii, 1878, p. 34, pl. iii, fig. 2.

*Lepidoblennius marmoratus* McCull. & McNeill, Rec. Aust. Mus., xii, 1918, p. 24

McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 62, pl. v, fig. 3.

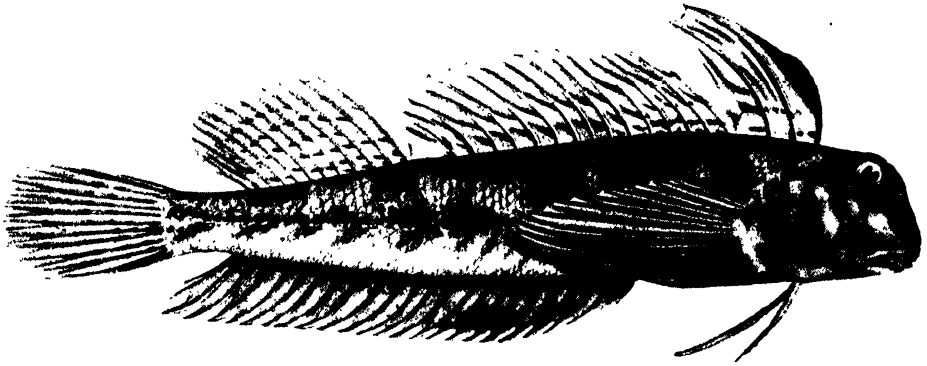


Fig. 250. *Lepidoblennius marmoratus*.

**HELCOGRAMMA McCulloch & Waite, 1918 (decurrens).**

**HELCOGRAMMA DECURRENS McCulloch & Waite.**

*Helcogramma decurrens* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 52, pl. iii, fig. 2.

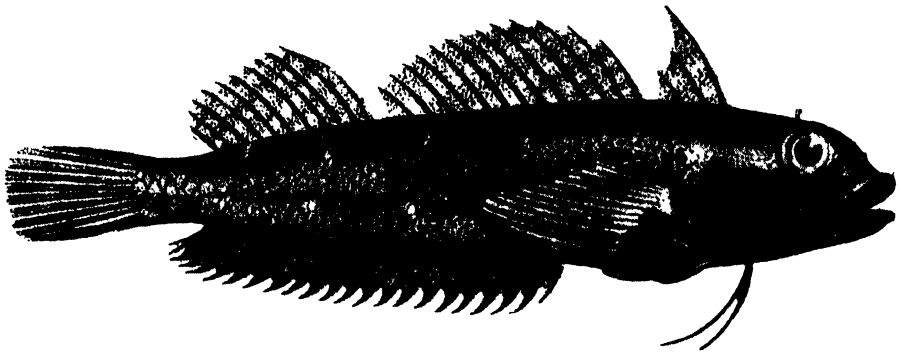


Fig. 251. *Helcogramma decurrens*.

**TRIANECTES McCulloch & Waite, 1918 (bucephalus).**

**TRIANECTES BUCEPHALUS McCulloch & Waite.**

*Trianectes bucephalus* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 53, pl. iii, fig. 3.

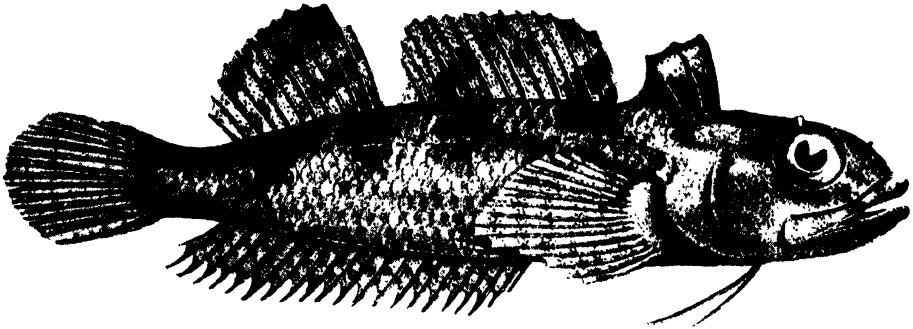


Fig. 252. *Triacetes bucephalus*.

FAMILY BROTULIDAE.

**DERMATOPSIS** Ogilby, 1896 (macrodon).

**DERMATOPSIS MULTIRADIATUS** McCulloch & Waite.

*Dermatopsis multiradiatus* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 63, pl. v, fig. 4.

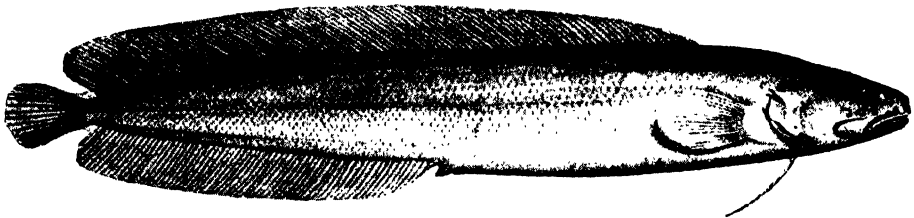


Fig. 253. *Dermatopsis multiradiatus*.

FAMILY OPHIDIIDAE.

**GENYPTERUS** Phillipi, 1857 (nigricans).

**GENYPTERUS BLACODES** Bloch & Schneider (Rockling).

*Ophidium blacodes* Bl. & Schn., Syst. Ichth., 1801, p. 484.

*Genypterus blacodes* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 379 (part);  
Stead, Edib. Fish. N.S.W., 1908, p. 117, pl. lxxx.

*Genypterus tigrinus* Klunz., Arch. f. Naturg., xxxviii, 1872, p. 39.

*Genypterus australis* Cast., P.Z.S., Viet., i, 1872, p. 164; McCoy, Prod. Zool.  
Viet., dec. iii, 1879, pl. xxvii, fig. 1.



Fig. 254. *Genypterus blacodes*.

Neither of the two described species is brought to our markets in payable quantity.

**GENYPTERUS MICROSTOMUS Regan.**

*Genypterus microstomus* Regan, A.M.N.H. (7), xi, 1903, p. 599; McCull., Endeavour Res., ii, 1914, p. 159, pl. xiv, fig. 2.



Fig. 255. *Genypterus microstomus*.

**ORDER HETEROSOMATA.**

**FAMILY BOTHIDAE.**

**LOPHONECTES Günther, 1880 (gallus).**

**LOPHONECTES GALLUS Günther (Crested Flounder).**

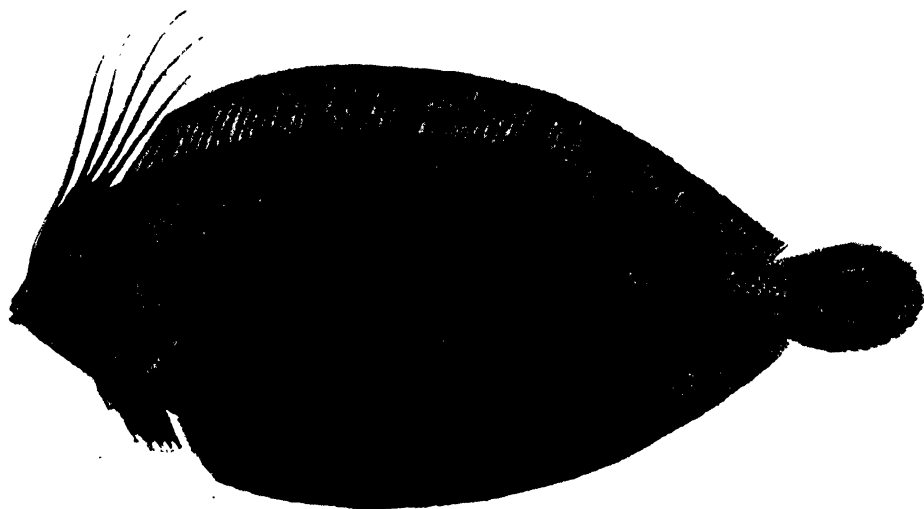


Fig. 256. *Lophonectes gallus*.

*Lophonectes gallus* Günth., Chall. Rep., i, 1880, p. 29, pl. xv, fig. B (reversed).

*Lophorhombus cristatus* Maccl., P.L.S., N.S.W., vii, 1882, p. 14.

Though esteemed, as everywhere, flat-fishes are far from common in our markets and always command high prices. Scientifically, the Order needs revision.

## FAMILY PLEURONECTIDAE.

**RHOMBOSOLEA** Günther, 1862 (monopus=plebeia).

**RHOMBOSOLEA PLEBEIA** Richardson (Flounder).

*Rhombus plebeius* Rich., in Dieffenbach, ii, 1843, p. 222.

*Rhombosolea monopus* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 459.

*Rhombosolea plebeia* Gill, Mem. Nat. Acad. Sci., vi, 1893, p. 121; Waite, Rec. Cant. Mus., i, 1911, p. 203, pl. xxxv.

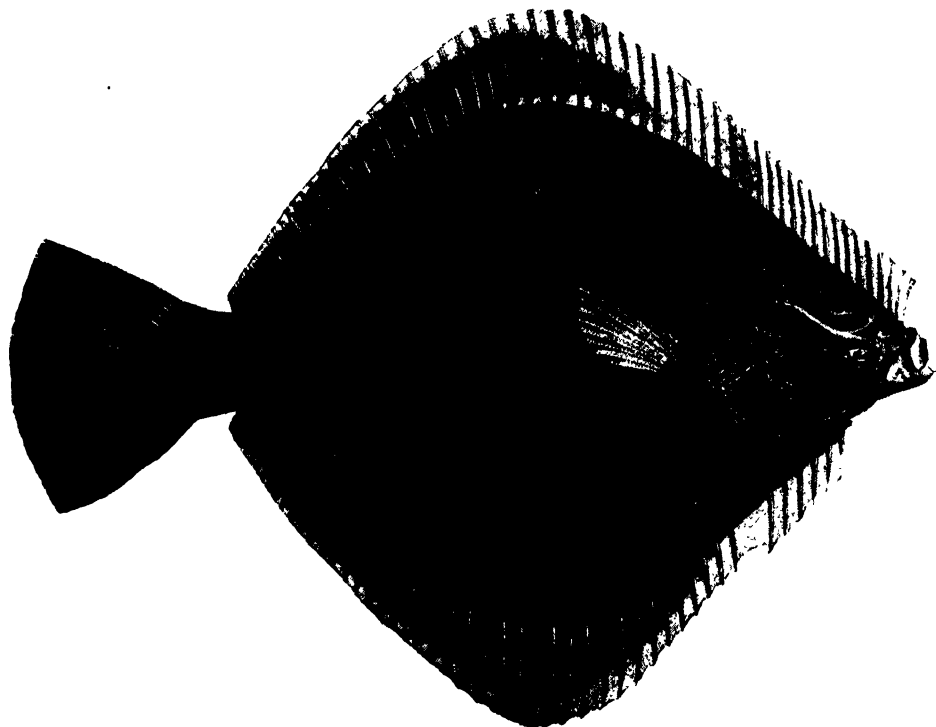


Fig. 257. *Rhombosolea plebeia*.

**RHOMBOSOLEA VICTORIAE** (Melbourne Flounder).

*Pleuronectes? victoriae* Cast., P.Z.S., Vict., i, 1872, p. 168.

**AMMOTRETIS** Günther, 1862 (rostratus).**AMMOTRETIS ROSTRATUS** Günther (Long-snouted Flounder).

*Ammotretis rostratus* Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 458; Stead, Edib. Fish. N.S.W., 1908, p. 103, pl. lxx.

*Ammotretis adpersus* Kner, Reise Novara, Fisch., 1868, p. 286, pl. xiii, fig. 4.

*Rhombosolea bassensis* Cast., P.Z.S., Vict., i, 1872, p. 167.

*Ammotretis zonatus* MacL., P.L.S., N.S.W., vii, 1882, p. 367.

*Ammotretis macleayi* Ogil., P.L.S., N.S.W., x, 1885, p. 121, 122.

*Peltorhamphus bassensis* Waite, Rec. Aust. Mus., vi, 1906, p. 198, pl. xxxiv.

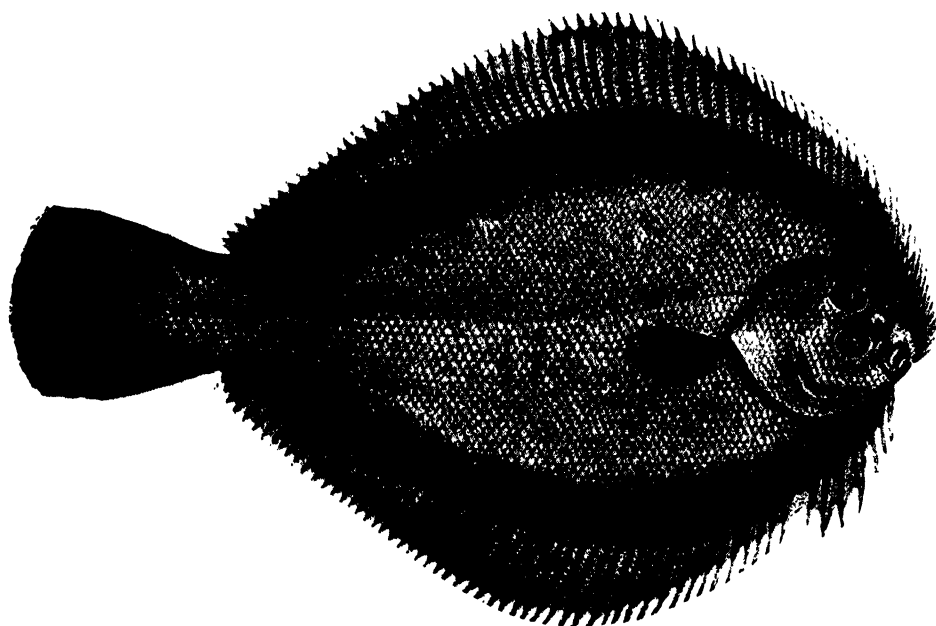


Fig. 259. *Ammotretis rostratus*.

**AMMOTRETIS ELONGATUS McCulloch.**

*Ammotretis elongatus* McCull., Endeavour Res., ii, 1914, p. 123, pl. xxvii.

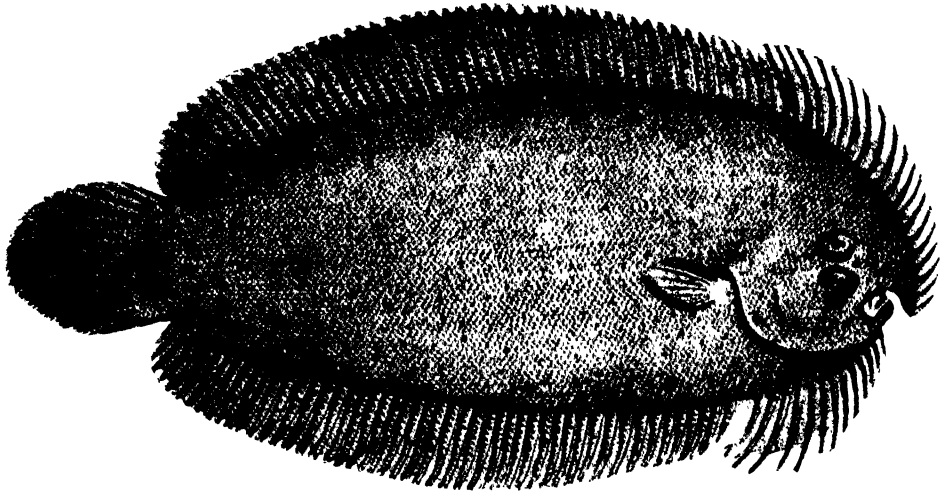


Fig. 260. *Ammotretis elongatus*.

**AMMOTRETIS TUDORI McCulloch.**

*Ammotretis tudori* McCull., Endeavour Res., ii, 1914, p. 124, pl. xxvi.

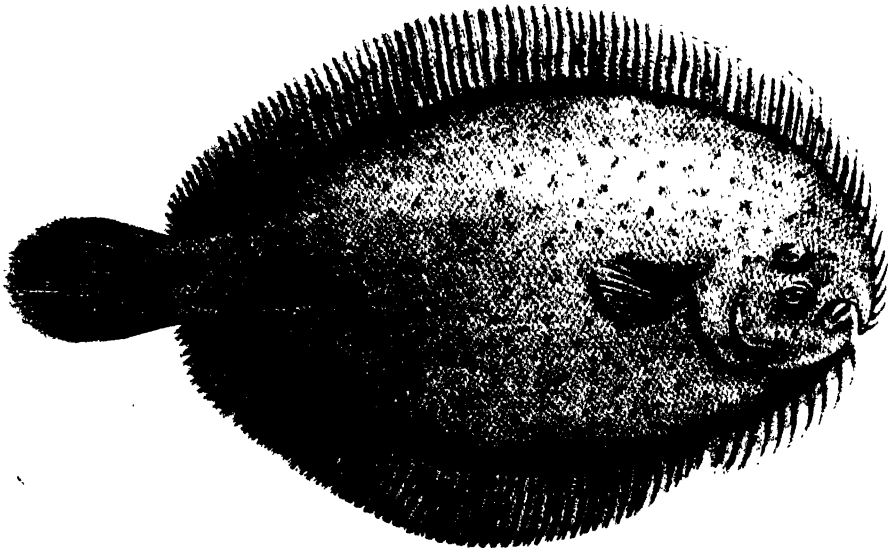


Fig. 261. *Ammotretis tudori*.



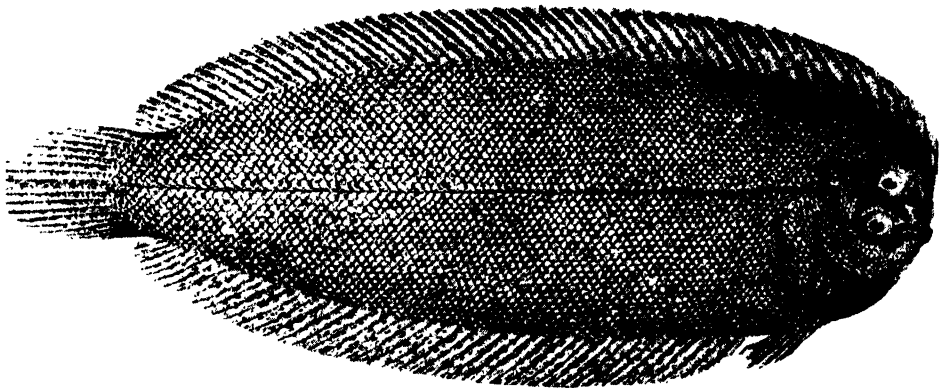
## FAMILY SOLEIDAE.

**ASERAGGODES** Kaup, 1858 (*guttulatus*).**ASERAGGODES HAACKEANA** Steindachner (Sole).

*Solea (Achirus) haackeana* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 195 and  
Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1104, pl. i, fig. 3.

*Solea (Aseraggodes) textilis* Rams. & Ogil., P.L.S., N.S.W. (2), i, 1886, p. 6.

*Aseraggodes haackeana* McCull., Mem. Qld. Mus., v, 1916, p. 59.

Fig. 262. *Aseraggodes haackeana*.

## ORDER DISCOCEPHALI.

## FAMILY ECHENEIDIDAE.

**ECHENEIS** Linnaeus, 1758 (*naucrates*).**ECHENEIS AUSTRALIS** Bennett (Sucker Fish).

*Echeneis australis* Benn., Narr. Whaling Voy., ii, 1840, p. 273; Waite, T.R.S.,  
S.A., xxxix, 1915, p. 340, pl. xi (disk).

*Echeneis scutata* Günth., A.M.N.H. (3), v, 1860, p. 401, pl. x, fig. B.

*Remilegia australis* Gill, Proc. Acad. Nat. Sci. Phil., 1864, p. 61.

Fig. 263. *Echeneis australis*.

The only example recorded from our waters accompanied a Norwegian vessel into dock, probably from the Indian Ocean.

Sucker fishes attach themselves to ships, whales, sharks, and other fishes by means of the sucking disk on the top of the head.

### **ECHENEIS REMORA Linnaeus (Remora).**

*Echeneis remora* Linn., Syst. Nat. (ed. x), 1758, p. 260; Day, Fish. Gt. Brit. and Irel., i, 1881, p. 108, pl. xxxix, fig. 2.



Fig. 264. *Echeneis remora*.

Under the title "The Myth of the Ship-holder," Mr. E. W. Gudger <sup>(18)</sup> has brought together the legends of the habits attributed to this curious fish.

## **ORDER SCLEROPAREI.**

### **FAMILY SCORPAENIDAE.**

#### **SCORPAENA Linnaeus, 1758 (poreus).**

##### **SCORPAENA CRUENTA Richardson (Red Rock-cod).**

*Scorpaena cruenta* Rich., A.M.N.H., ix, 1842, p. 217; Ogil., Edib. Fish. N.S.W., 1893, p. 63, pl. xx; Stead, Fish. Aust., 1906, p. 193, pl. vii and Edib. Fish. N.S.W., 1908, p. 108, pl. lxxv.

*Scorpaena ergastulorum* Rich., loc. cit.

*Scorpaena militaris* Rich., Zool. Ereb. & Terr., 1845, p. 22, pl. xiv, fig. 1, 2.

(18) Gudger, Ann. Mag. Nat. Hist. (9), ii, 1918, p. 271, pl. xv-xvii and fig. 10 and iv, 1919, p. 17.

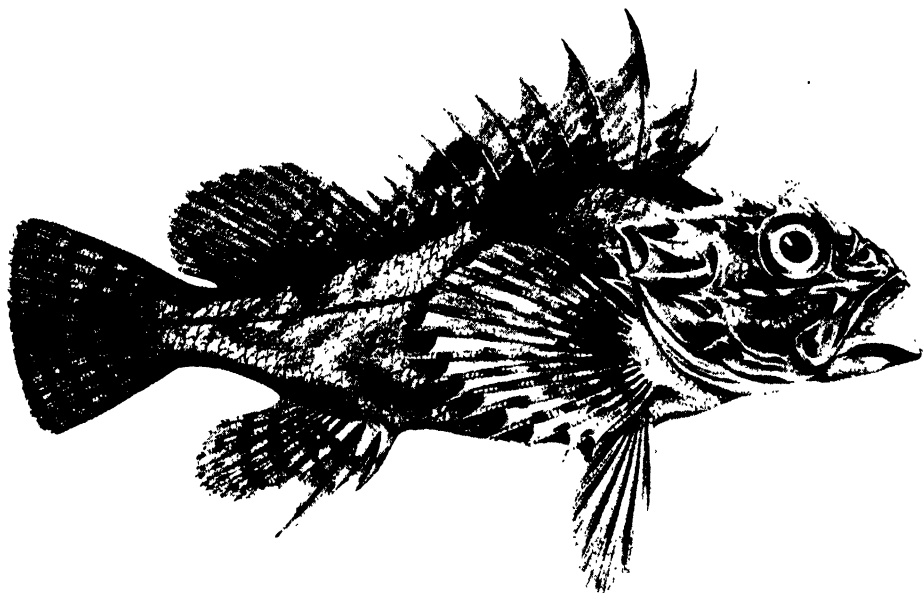


Fig. 265. *Scorpaena cruenta*.

Well known to rock anglers, its capacious mouth accommodating very large baits. The flesh is white and tender.

**HELICOLENUS** Goode & Bean, 1895 (dactylopterus).

**HELICOLENUS PERCOIDES** Richardson (Red Gurnard-perch).

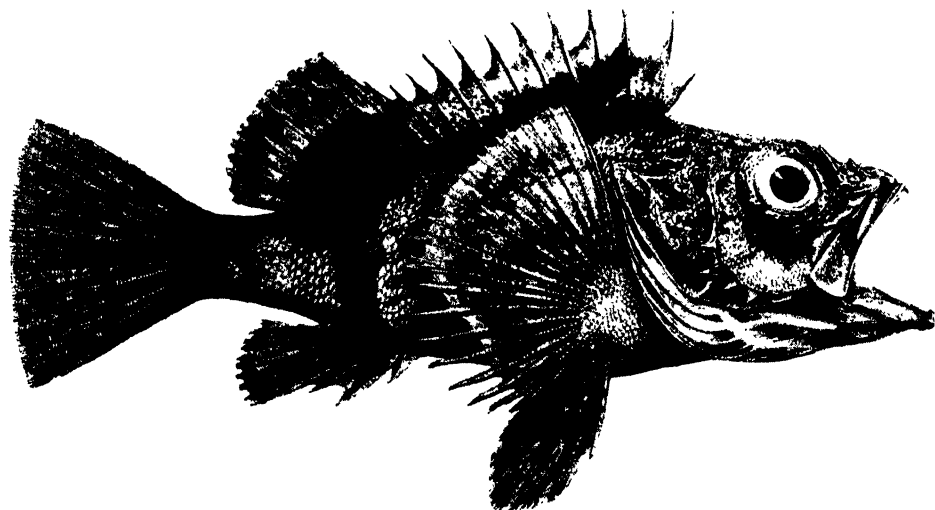


Fig. 266. *Helicolenus percoides*.

*Sebastes percooides* Rich., A.M.N.H., ix, 1842, p. 384 and Zool. Ereb. & Terr., 1845, p. 23, pl. xv, fig. 1, 2; McCoy, Prod. Zool. Viet., dec. iv, 1879, pl. xxxiii; Ten. Woods, Fish., N.S.W., 1883, pl. xiv; Ogil., Edib. Fish. N.S.W., 1893, p. 61.

*Sebastes alporti* Cast., P.Z.S., Viet., ii, 1873, p. 40.

*Scorpaena barathri* Hect., T.N.Z.L., vii, 1875, p. 245, pl. x, fig. 15a.

*Sebastapistes percooides* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 46.

*Helicolenus percooides* McCull., Rec. Aust. Mus., vi, 1907, p. 350.

A fair food fish, but not regarded as equal to the preceding species.

**NEOSEBASTES Guichenot, 1867 (scorpaenoides).**

**NEOSEBASTES SCORPAENOIDES Guichenot (Gurnard-perch).**

*Neosebastes scorpaenoides* Guich., Mem. Soc. Sci. Cherbourg, xiii, 1867, p. 85; McCoy, Prod. Zool. Viet., dec. xx, 1890, pl. cxviii.

*Sebastes scorpaenoides* Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 365, pl. v, fig. 1 (head).

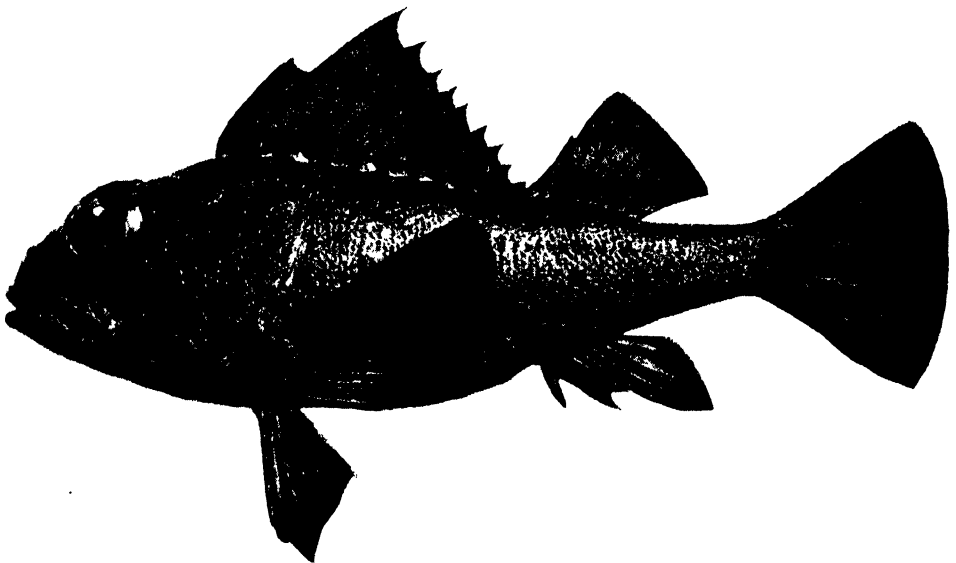


Fig. 267 *Neosebastes scorpaenoides*.

A winter market fish.

**NEOSEBASTES PANDUS** Richardson (Gurnard-perch).

*Scorpaena panda* Rich., A.M.N.H., ix, 1842, p. 216.

*Sebastes pandus* Rich., Zool. Ereth. & Terr., 1846, p. 70, pl. xli, fig. 3, 4.

*Neosebastes panda* Guich., Mem. Soc. Sci. Cherbourg, xiii, 1867, p. (86?).

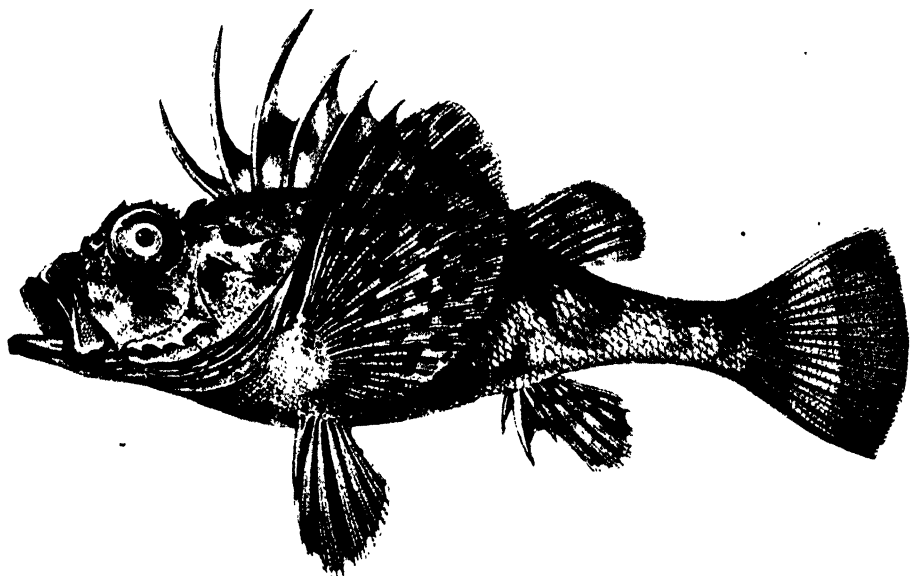


Fig. 268. *Neosebastes pandus*.

Not so well known here as in Victoria, where it is a common market fish.

**NEOSEBASTES NIGROPUNCTATUS** McCulloch (Black-spotted Gurnard-perch).

*Neosebastes nigropunctatus* McCull., Endeavour Res., iii, 1915, p. 157, pl. xxx.

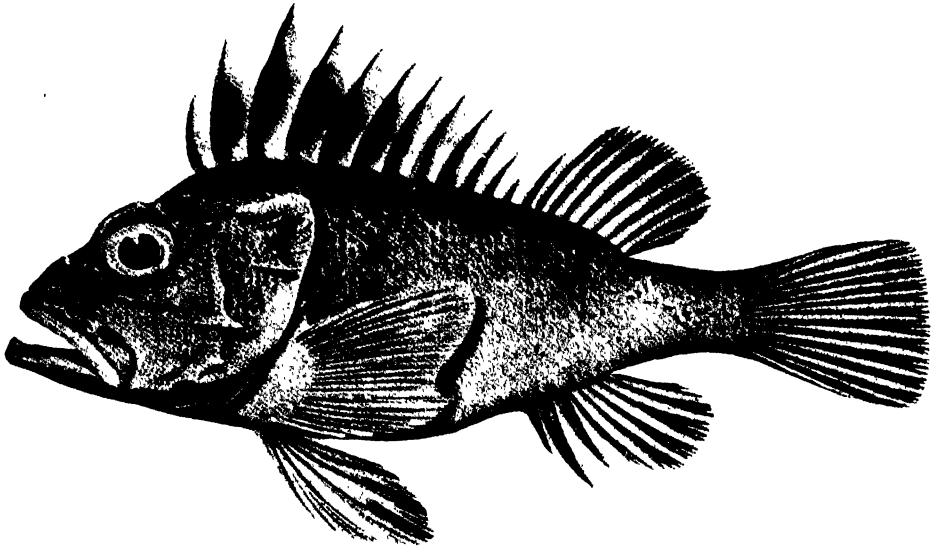


Fig. 269. *Neosebastes nigropunctatus*.

**NEOSEBASTES THETIDIS** Waite (Thetis Fish).

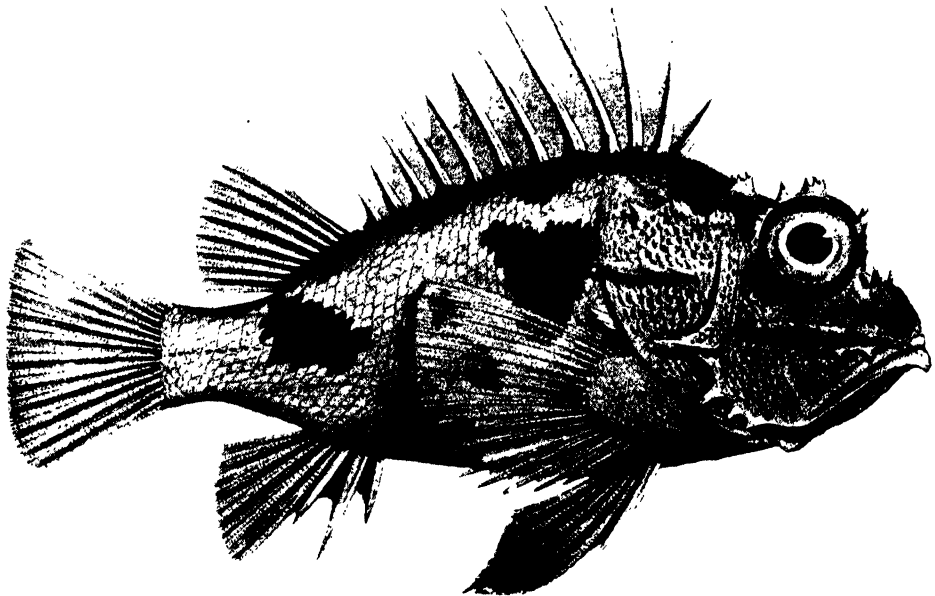


Fig. 270. *Neosebastes thetidis*.

*Sebastes thetidis* Waite, Mem. Aust. Mus., iv, 1899, p. 100, pl. xx.

*Sebastodes thetidis* Waite, Mem. N.S.W. Nat. Club., ii, 1904, p. 47.

*Neosebastes thetidis* McCull., Endeavour Res., iii, 1915, p. 154.

The name of this fish is associated with the first trawling venture of the N.S. Wales Government, conducted in 1898; H.M.C.S. "Thetis" being employed. The writer of this catalogue was in charge of the Zoological operations. The Thetis Fish has been obtained at Glenelg, S.A.

### **NEOSEBASTES PANTICA McCulloch & Waite.**

*Neosebastes pantica* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 64, pl. iv, fig. 1.

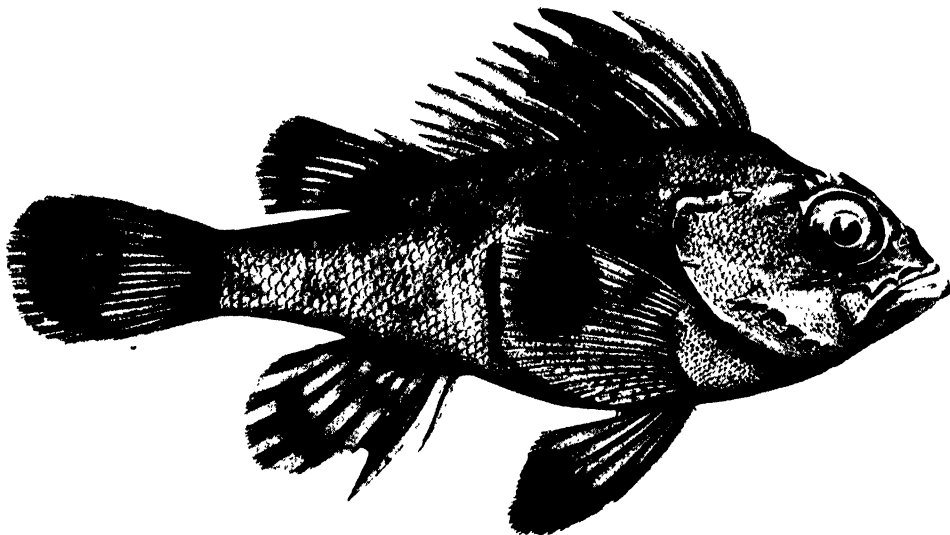


Fig. 271. *Neosebastes pantica*.

### **GYMNAPISTES Swainson, 1839 (marmoratus).**

#### **GYMNAPISTES MARMORATUS Cuvier & Valenciennes (Cobbler).**

*Apistus marmoratus* Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 416; Valenc. in Cuv., Règ. Anim., III. Poiss., 1839, pl. xxiv, fig. 3.

*Apistes marmoratus* Cuv. (Griff.), Anim. King., x, 1834, pl. xxii, fig. 3.

*Gymnapistes marmoratus* Swains., Nat. Hist. Fish., ii, 1839, p. 266.

*Pentaroge marmorata* Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 132; McCull., Endeavour Res., iii, 1915, p. 161, pl. xxxvi, fig. 2.

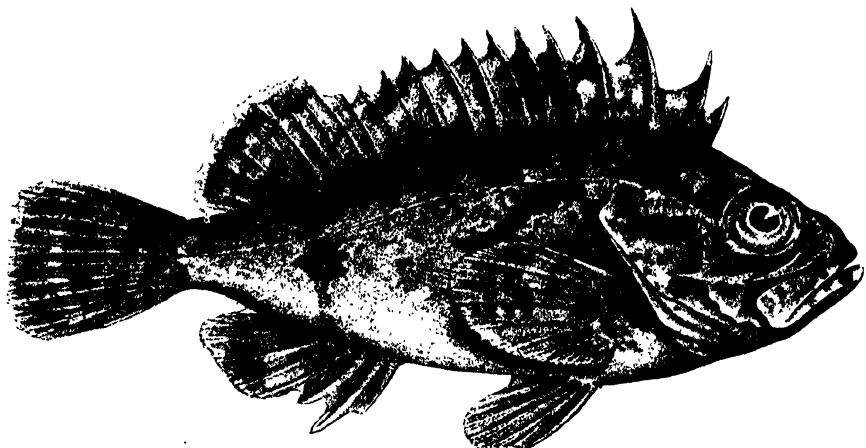


Fig. 272. *Gymnapistes marmoratus*.

Of no commercial value; known to every boy on the coast, and handled with caution on account of its venomous spines.

**GLYPTAUCHEN** Günther, 1860 (*panduratus*).

**GLYPTAUCHEN PANDURATUS** Richardson (Saddle-head).

*Apistes panduratus* Rich., P.Z.S., 1850, p. 58, pl. i, fig. 3, 4.

*Glyptauchen panduratus* Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 121.

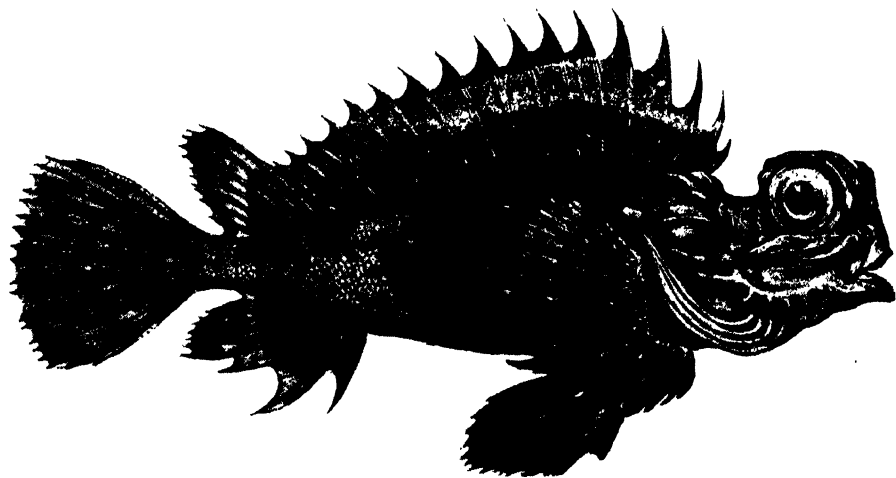


Fig. 273. *Glyptauchen panduratus*.

The Family *Scorpaenidae* furnishes some bizarre forms, of which this is one.



## FAMILY APLOACTIDAE.

**APLOACTIS** Schlegel, 1843 (*aspera*).**APLOACTIS MILESII** Richardson (Velvet-fish).*Aploactis milesii* Rich., P.Z.S., 1850, p. 60, pl. i, fig. 1, 2.*Aploactisoma schomburgkii* Cast., P.Z.S., Viet., i, 1872, p. 244 and ii, 1873, p. 64.Fig. 274. *Aploactis milesii*.

The name Velvet-fish is also bestowed on *Gnathanacanthus*, to which it is more applicable.

## FAMILY PATAECIDAE.

**PATAECUS** Richardson, 1844 (*fronto*).**PATAECUS FRONTO** Richardson (Forehead Fish).Fig. 275. *Pataecus fronto*.

*Pataecus fronto* Rich., A.M.N.H., xiv, 1844, p. 280 and Zool. Ereb. & Terr., 1845, p. 20, pl. xiii, fig. 1, 2.

*Pataecus subocellatus* Günth., P.Z.S., 1871, p. 665, pl. lxiv.

For obvious reasons this fish has also received the book name of Red Indian Fish.

### **PATAECUS MACULATUS** Günther (Warty-fish).

*Pataecus maculatus* Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 292; Waite, Rec. Aust. Mus., vi, 1905, p. 75, pl. xv.

*Pataecus armatus* Johnston, P.R.S., Tasm., 1891, p. 33.



Fig. 276. *Pataecus maculatus*.

The members of the Family *Pataecidae* are small and of no value.

### **PATAECUS VINCENTII** Steindachner.

*Pataecus vincentii* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 195 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1085, pl. vii, fig. 2.



Fig. 277. *Pataecus vincentii*.

The specimen figured is the only adult example so far recorded; it was recently obtained at Glenelg after a severe storm.

**NEOPATAECUS Steindachner, 1883 (maculatus=*waterhousii*).**

**NEOPATAECUS WATERHOUSII Castelnau.**

*Pataecus waterhousii* Cast., P.Z.S., Viet., i, 1872, p. 244.

*Neopataecus maculatus* Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1087, pl. vii, fig. 3 (not Günth.).

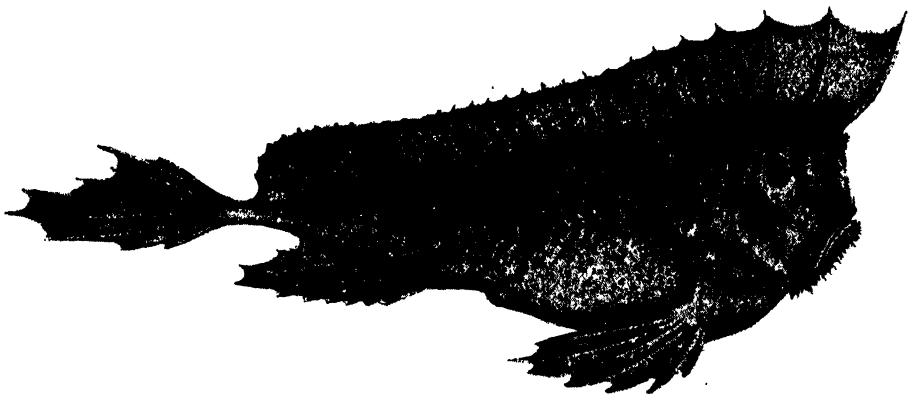


Fig. 278. *Neopataecus waterhousii*.

Readily distinguished from members of the allied genus by the separate tail fin.

FAMILY CONGIOPIDAE.

**CONGIOPUS** Perry, 1811 (pereatus).

**CONGIOPUS LEUCOPAECILUS** Richardson (Pigfish).

*Agriopus leucopaeccilus* Rich., Zool. Ereb. & Terr., 1846, p. 60, pl. xxxvii, fig. 4, f.  
*Congiopodus leucopoeccilus* Gill, Mem. Nat. Acad. Sci. Wash., vi, 1893, p. 118.

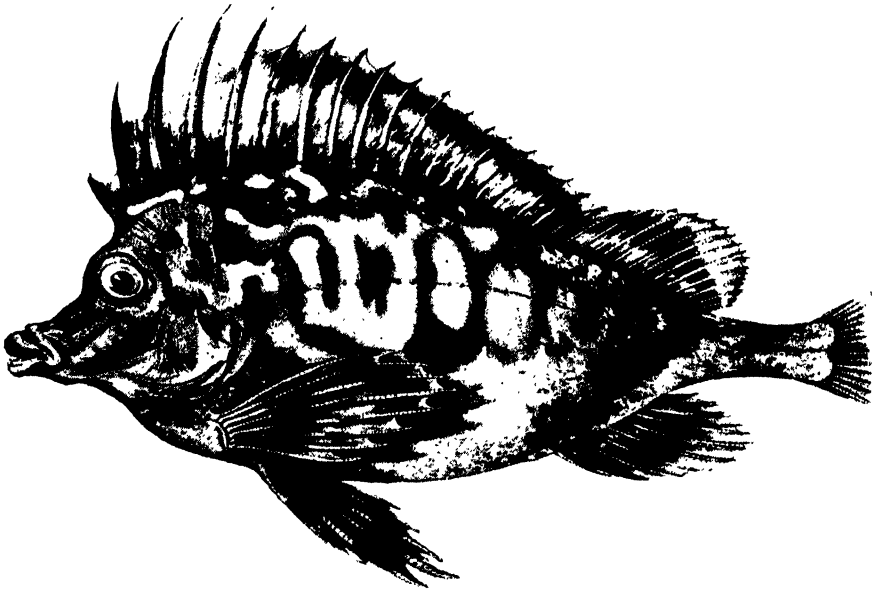


Fig. 279. *Congiopus leucopaeccilus*.

FAMILY GNATHANACANTHIDAE.

**GNATHANACANTHUS** Bleeker, 1855 (goetzeei).

**GNATHANACANTHUS GOETZEEI** Bleeker (Velvet-fish).

*Gnathanacanthus goetzeei* Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 41  
 fig. 1.

*Holoxenus cutaneus* Günth., A.M.N.H. (4), xvii, 1876, p. 393.

*Beridia flava* Cast., P.L.S., N.S.W., ii, 1878, p. 229, pl. ii.

*Gnathanacanthus goetzi* Gill, P.U.S. Nat. Mus., xiv, 1891, p. 701, fig.

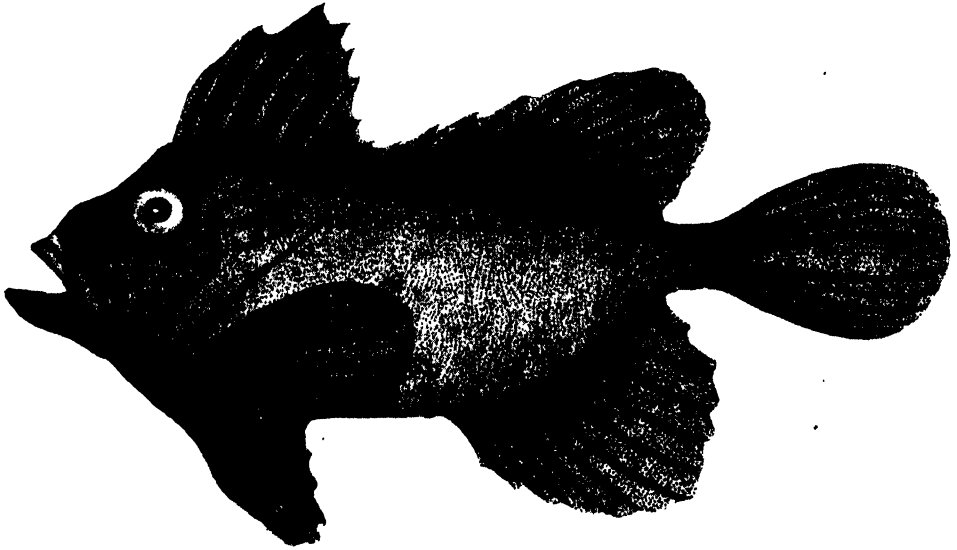


Fig. 280. *Gnathanacanthus goetzei*.

Specimens obtained alive, in our waters, are of beautiful orange colour.

### FAMILY PLATYCEPHALIDAE.

**PLATYCEPHALUS** Bloch, 1795 (spathula).

**PLATYCEPHALUS FUSCUS** Cuvier & Valenciennes (Dusky Flathead).

*Platycephalus fuscus* Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 241; Quoy & Gaim., Voy. Astrolabe, iii, 1835, p. 681, pl. x, fig. 1; Ogil., Edib. Fish. N.S.W., 1893, p. 105, pl. xxviii; Stead, Edib. Fish. N.S.W., 1908, p. 111, pl. lxxvii; Roughley, Fish. Aust., 1916, p. 181, pl. lxiii.

?*Platycephalus cinereus* Günth., P.Z.S., 1871, p. 662.



Fig. 281. *Platycephalus fuscus*.

All the Flatheads are good food. The Dusky and Sand Flatheads are the species commonly marketed in Adelaide,

**PLATYCEPHALUS BASSENSIS** Cuvier & Valenciennes (Sand Flathead).

*Platycephalus bassensis* Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 247; Quoy & Gaim., Voy. Astrolabe, iii, 1835, p. 683, pl. x, fig. 3; Stead, Edib. Fish. N.S.W., 1908, p. 112, pl. lxxviii.

*Platycephalus tasmanius* Rich., Zool. Ereth. & Terr., 1845, p. 23, pl. xviii, fig. 1, 2.

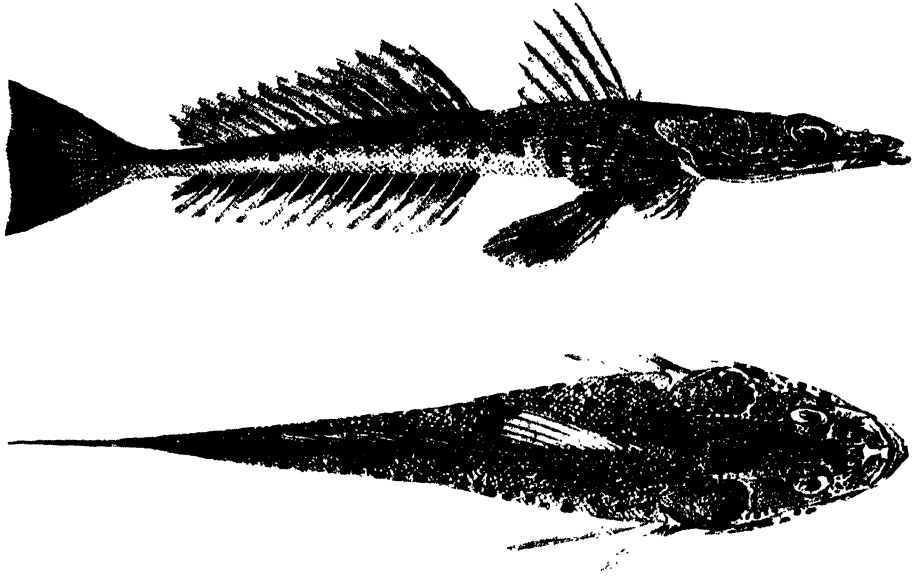


Fig. 282. *Platycephalus bassensis*.

**PLATYCEPHALUS LAEVIGATUS** Cuvier & Valenciennes.

*Platycephalus laevigatus* Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 248; Quoy & Gaim., Voy. Astrolabe, iii, 1835, p. 684, pl. x, fig. 4.

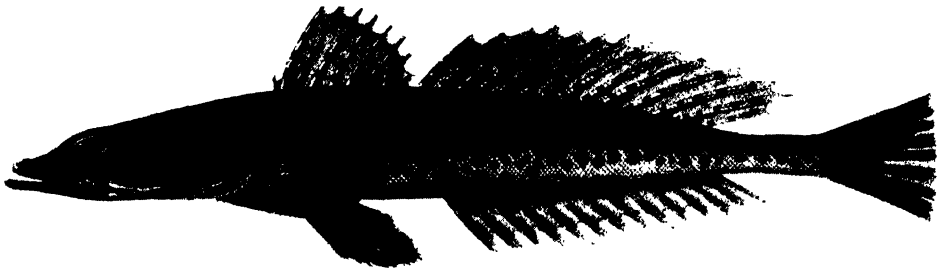


Fig. 283. *Platycephalus laevigatus*.

**PLATYCEPHALUS INOPS** Jenyns.

*Platycephalus inops* Jenyns, Zool. Beagle, iii, 1842, p. 33.

**PLATYCEPHALUS HAACKEI** Steindachner.

*Platycephalus haackei* Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 195 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1081, pl. ii, fig. 2.

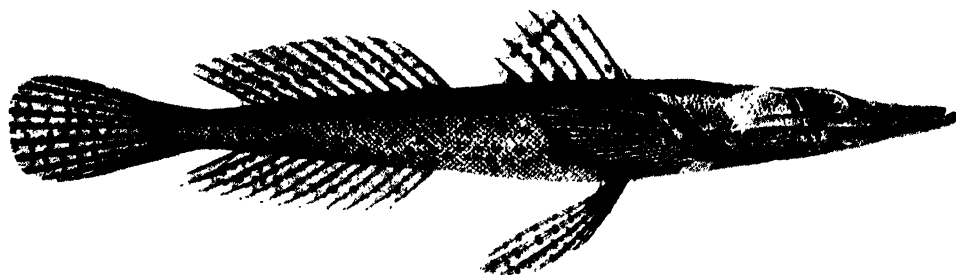


Fig. 285. *Platycephalus haackei*.

**PLATYCEPHALUS SEMERMIS** De Vis.

*Platycephalus semermis* De Vis, P.L.S., N.S.W., viii, 1883, p. 285.

**NEOPLATYCEPHALUS** Castelnau, 1872 (*grandis*).**NEOPLATYCEPHALUS GRANDIS** Castelnau.

*Neoplatycephalus grandis* Cast., P.Z.S., Vict., i, 1872, p. 87.

**NEOPLATYCEPHALUS CONATUS** Waite & McCulloch (Deep-water Flathead).

*Neoplatycephalus conatus* Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 466, pl. xii.

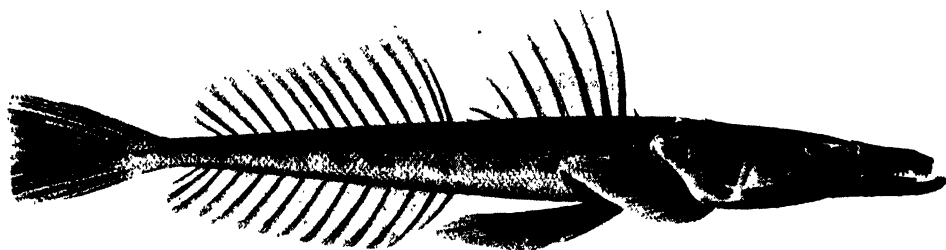


Fig. 288. *Neoplatycephalus conatus*.

**THYSANOPHRYS** Ogilby, 1898 (*cirronasus*).**THYSANOPHRYS CIRRONASUS** Richardson (Tassel-snouted Flathead).

*Platycephalus cirronasus* Rich., Zool. Ereb. & Terr., 1846, p. 114, pl. li, fig. 7-10.

*Thysanophrys cirronasus* Ogil., P.L.S., N.S.W., xxiii, 1898, p. 40.

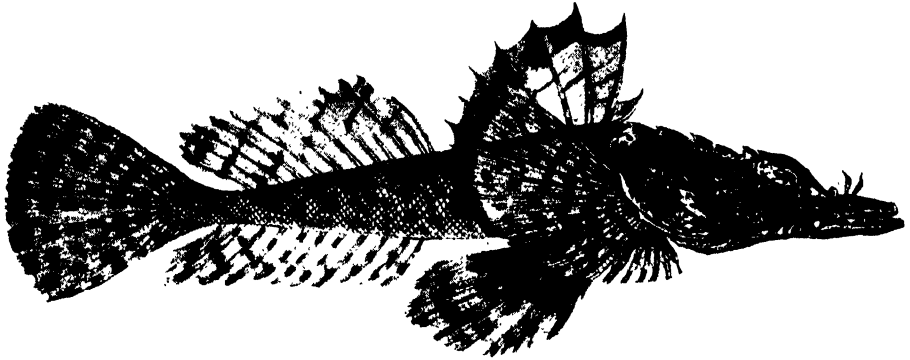


Fig. 289. *Thysanophrys cirronasus*.

FAMILY HOPLICHTHYIDAE.

**HOPLICHTHYS** Cuvier & Valenciennes, 1829 (*langsдорfi*).

**HOPLICHTHYS HASWELLI** McCulloch.

*Hoplichthys haswelli* McCull., Rec. Aust. Mus., vi, 1907, p. 351, pl. lxiv and Endeavour Res., ii, 1914, p. 132.

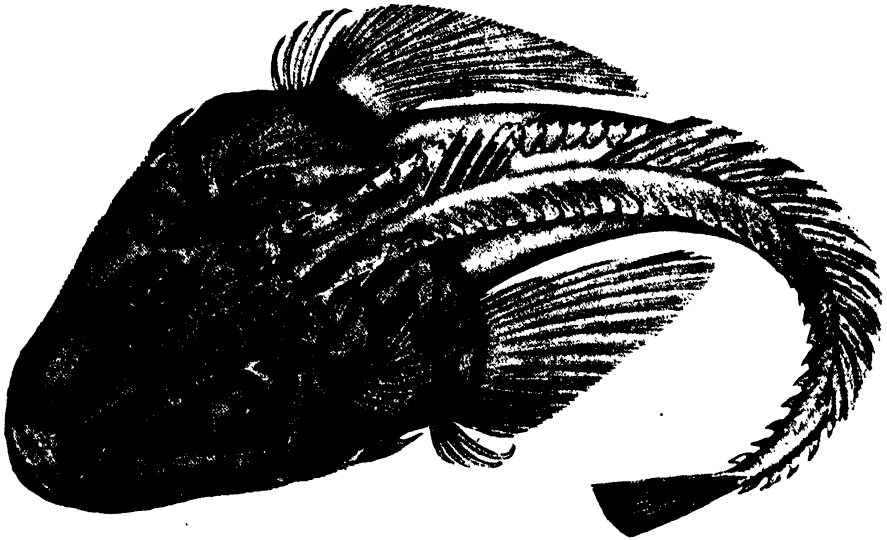


Fig. 290. *Hoplichthys haswelli*.

A deep-water form taken only by the trawl.



## FAMILY TRIGLIDAE.

**LEPIDOTRIGLA** Günther, 1860 (*aspera*).**LEPIDOTRIGLA VANESSA** Richardson (Butterfly Gurnard).

*Trigla vanessa* Rich., P.Z.S., 1839, p. 97 and T.Z.S., iii, 1849, p. 83, pl. v, fig. 1.

*Lepidotrigla vanessa* Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 197; McCoy, Prod. Zool. Viet., dec. i, 1878, pl. v.

This and the next species are small fishes, having large scales compared with those of other Gurnards.

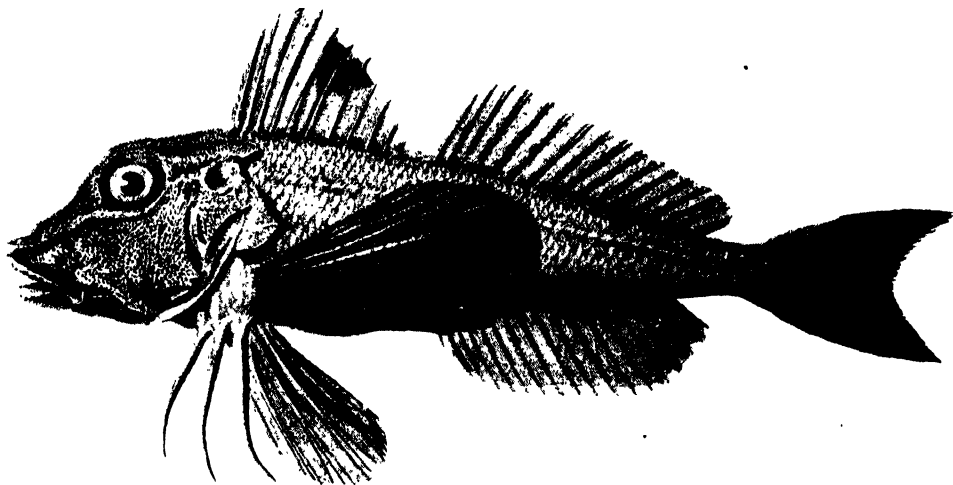


Fig. 291. *Lepidotrigla vanessa*.

**PARATRIGLA** Ogilby, 1911 (*pleuracanthica*).**PARATRIGLA PLEURACANTHICA** Richardson.

*Trigla pleuracanthica* Rich., Zool. Ereb. & Terr., 1845, p. 23, pl. xvi, fig. 1-4.

*Lepidotrigla pleuracanthica* Rams. & Ogil., P.I.S., N.S.W., x, 1886, p. 578.

*Paratrigla pleuracanthica* Ogil., Ann. Qld. Mus., x, 1911, p. 56.

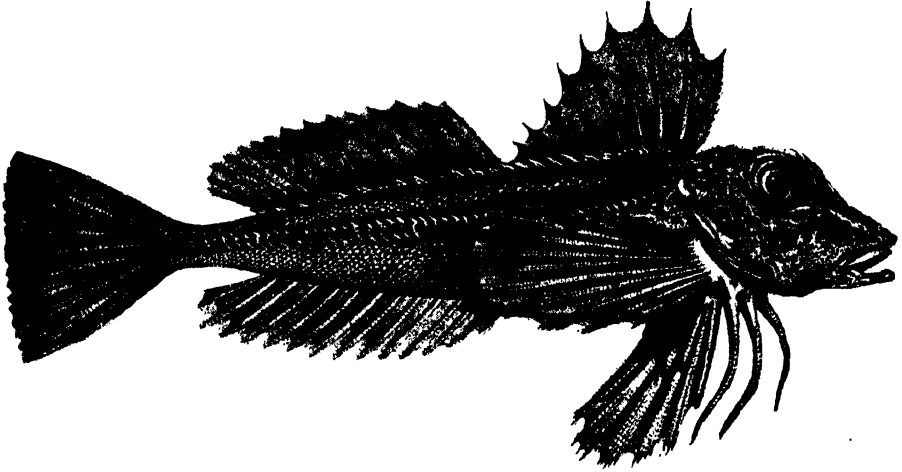


Fig. 292. *Paratrigla pleuracantha*.

**PTERYGOTRIGLA** Waite, 1899 (*polyommata*).

**PTERYGOTRIGLA POLYOMMATA** Richardson (Flying Gurnard).

*Trigla polyommata* Rich., P.Z.S., 1839, p. 96 and T.Z.S., iii, 1849, p. 87, pl. v, fig. 2; Ogil., Edib. Fish. N.S.W., 1893, p. 111.

*Hoplonotus polyommatus* Guich., Ann. Soc. Linn. Maine-et-Loire, Ichth., ix, 1866, p. 3.

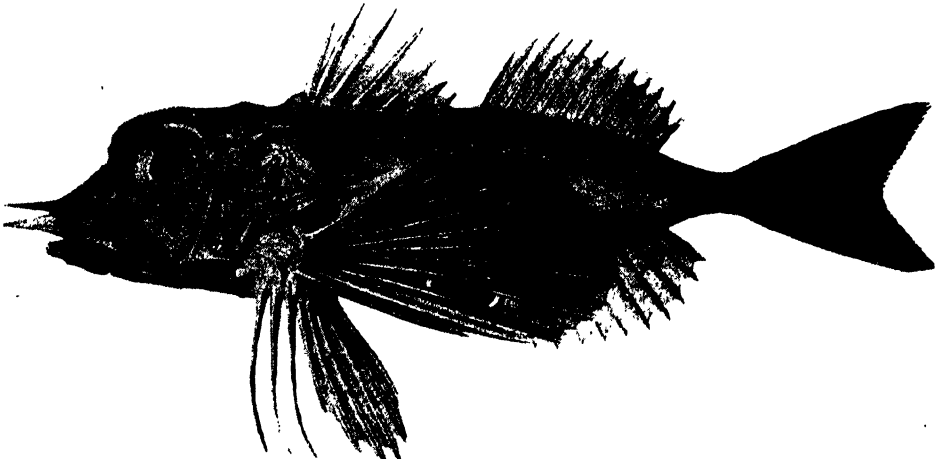


Fig. 293. *Pterygotrigla polyommata*.

*Trigla amoena* Cast., P.Z.S., Viet., ii, 1873, p. 131.

*Pterygotrigla polyommata* Waite, Mem. Aust. Mus., iv, 1899, p. 108; Roughley, Fish. Aust., 1916, p. 186, pl. lxxv.

The name Flying Gurnard is bestowed on account of its reputed habit of jumping out of the water.

**CHELIDONICHTHYS Kaup, 1873 (hirundo).**

**CHELIDONICHTHYS KUMU Lesson & Garnot (Red Gurnard).**

*Trigla kumu* Less. & Garn., Voy. Coquille, Poiss., 1826, p. 214, pl. xix; McCoy, Prod. Zool. Viet., dec. i, 1878, pl. vi; Ogil., Edib. Fish. N.S.W., 1893, p. 109, pl. xxix.

*Trigla spinosa* McClell., Calcutta Journ. Nat. Hist., iv, 1844, p. 396, pl. xxii, fig. 2.

*Trigla dorsomaculata* Steind., Sitz. Akad. Wiss. Wien, lxxiv, 1876, p. 216.

*Chelidonichthys kumu* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 49; Stead, Edib. Fish. N.S.W., 1908, p. 114, pl. lxxix; Roughley, Fish. Aust., 1916, p. 184, pl. lxiv.

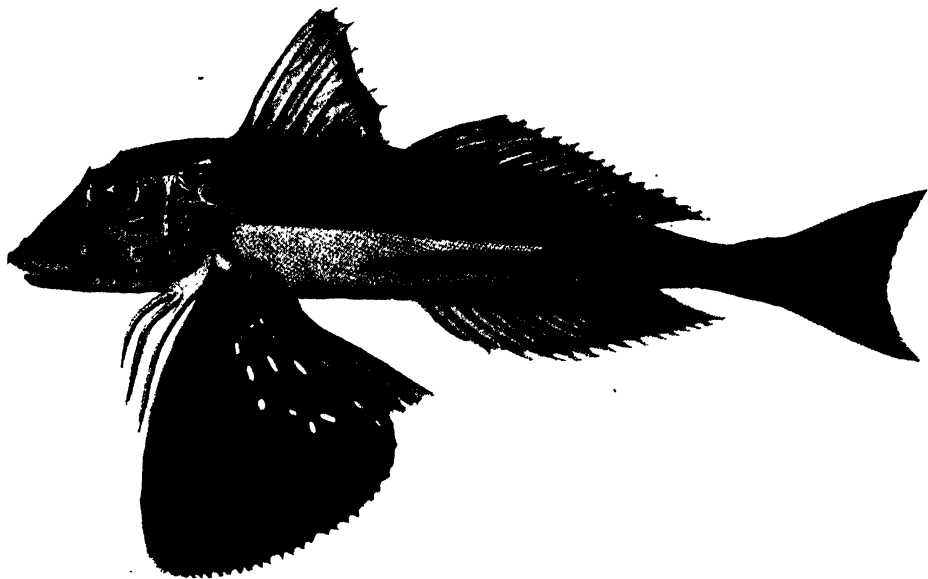


Fig. 294. *Chelidonichthys kumu*.

This and the Flying Gurnard are obtained plentifully where the trawl is operated; both species furnish excellent food, always in demand.

**ORDER XENOPTERI.****FAMILY GOBIESOCIDAE.****ASPASMOGASTER Waite, 1907 (spatula).****ASPASMOGASTER TASMANIENSIS Günther (Cling-fish).**

*Crepidogaster tasmaniensis* Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 507.

Members of this Family are called Cling-fishes because they fasten themselves to stones and seaweed by means of a sucker formed by their ventral fins. All are small and of no economic value.

**ASPASMOGASTER SPATULA Günther (Cling-fish).**

*Crepidogaster spatula* Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 508; Waite,

Rec. Aust. Mus., vi, 1906, p. 201, pl. xxxvi, fig. 4.

*Aspasmogaster spatula* Waite, *op. cit.*, 1907, p. 315.



Fig. 296. *Aspasmogaster spatula*.

**DIPLOCREPIS Günther, 1861 (puniceus).****DIPLOCREPIS COSTATUS Ogilby (Cling-fish).**

*Diplocrepis costatus* Ogil., P.L.S., N.S.W., x, 1885, p. 270; Waite, Rec. Aust.

Mus., v, 1904, p. 179, p. xxiv, fig. 1.

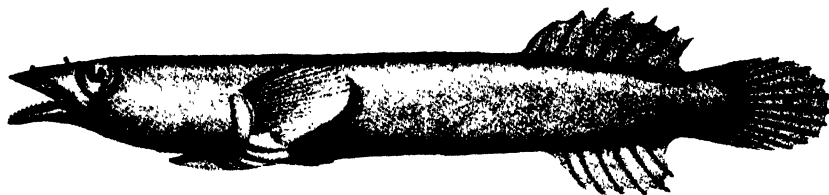


Fig. 297. *Diplocrepis costatus*.

**DIPLOCREPIS PARVIPINNIS** Waite (Small-finned Cling-fish).

*Diplocrepis parvipinnis* Waite, Rec. Aust. Mus., vi, 1906, p. 202, pl. xxxvi, fig. 3.



Fig. 298. *Diplocrepis parvipinnis*.

**ORDER PEDICULATI.****SUB-ORDER LOPHIOIDEA.****FAMILY ANTENNARIIDAE.**

**RHYCHERUS** Ogilby, 1907 (wildii=filamentosus).

**RHYCHERUS FILAMENTOSUS** Castelnau (Tasselled Frog-fish).

*Chironectes filamentosus* Cast., P.Z.S., Viet., i, 1872, p. 244 and ii, 1873, p. 65.

*Antennarius filamentosus* MacL., P.L.S., N.S.W., v, 1881, p. 579.

*Chironectes bifurcatus* McCoy, Prod. Zool. Viet., dec. xiii, 1886, pl. exxiii.



Fig. 299. *Rhycherus filamentosus*.

*Rhycherus wildii* and *R. bifurcatus* Ogil., P.R.S., Qld., xx, 1907, p. 18, 19.

*Rhycherus filamentosus* McCull., Mem. Qld. Mus., v, 1916, p. 68; McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 70, pl. vi, fig. 3 and text fig. 31.

The quaint sluggish fishes of this and the next Family are also known as Fishing-frogs, the flexible rod-like spine on the snout being furnished with a mobile fleshy lure that attracts smaller fishes to their destruction.

**HISTIOPHRYNE Gill, 1863 (bougainvilli).**

**HISTIOPHRYNE BOUGAINVILLI Cuvier & Valenciennes (Smooth Frog-fish).**

*Chironectes bougainvilli* Cuv. & Val., Hist. Nat. Poiss., xii, 1837, p. 431.

*Antennarius bougainvilli* Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 199.

*Histiophryne bougainvilli* Gill, Proc. Acad. Nat. Sci. Phil., 1863, p. 90; McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 72, pl. vii, fig. 1.

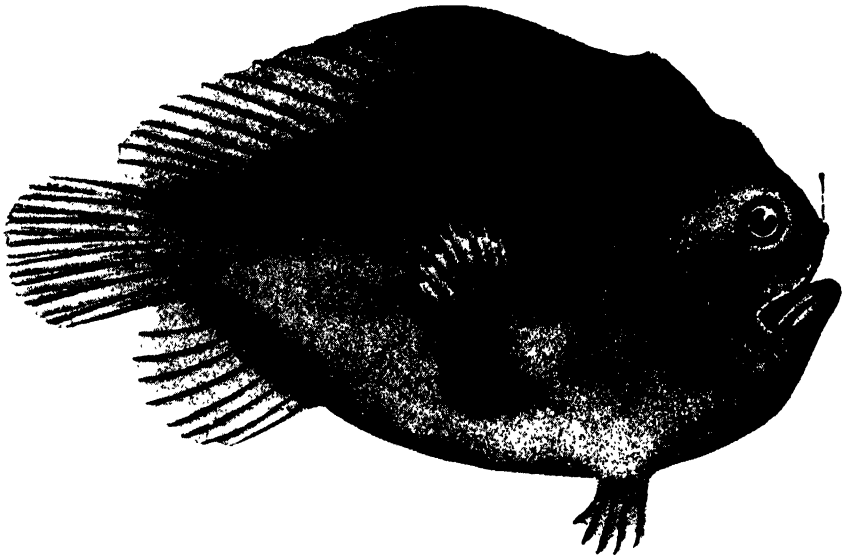


Fig. 300. *Histiophryne bougainvilli*.

**HISTIOPHRYNE SCORTEA McCulloch & Waite (White-spotted Frog-fish).**

*Histiophryne scortea* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 74, pl. vii, fig. 2 and var. *inconstans*, op. cit., p. 75.

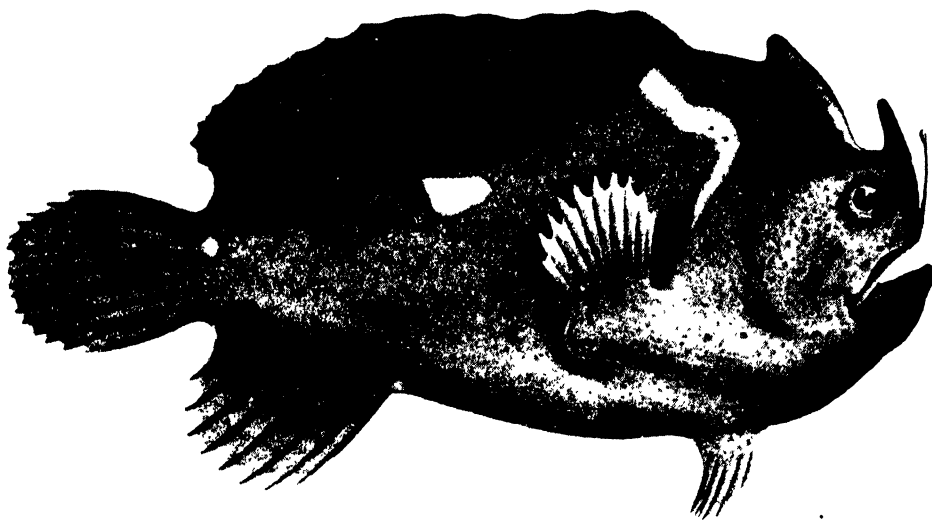


Fig. 301. *Histiophrys scortea*.

**ECHINOPHRYNE** McCulloch & Waite, 1918 (*crassispina*).

**ECHINOPHRYNE CRASSISPINA** McCulloch & Waite (Prickly Frog-fish).

*Echinophrys crassispina* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 67, pl. vi, fig. 2.

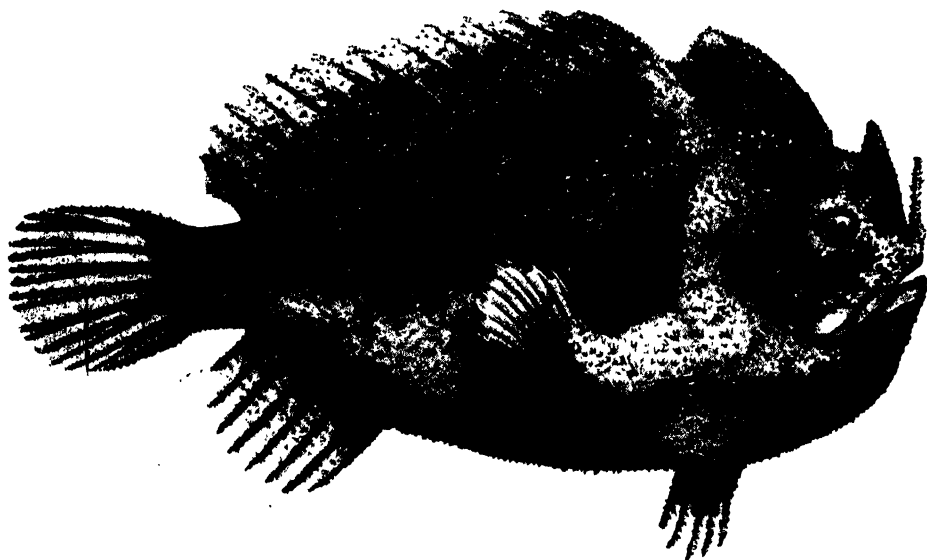


Fig. 302. *Echinophrys crassispina*.

**TRICHOPHRYNE McCulloch & Waite, 1918 (mitchellii).**

**TRICHOPHRYNE MITCHELLII Morton (Bristly Frog-fish).**

*Antennarius mitchellii* Mort., P.R.S., Tasm., 1897, p. 98.

*Trichophryne mitchellii* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 68, pl. vi, fig. 1.



Fig. 303. *Trichophryne mitchellii*.

FAMILY BRACHIONICHTHYIDAE.

**SYMPTERICHTHYS Gill, 1878 (laevis).**

**SYMPTERICHTHYS VERRUCOSUS McCulloch & Waite (Warty Frog-fish)**

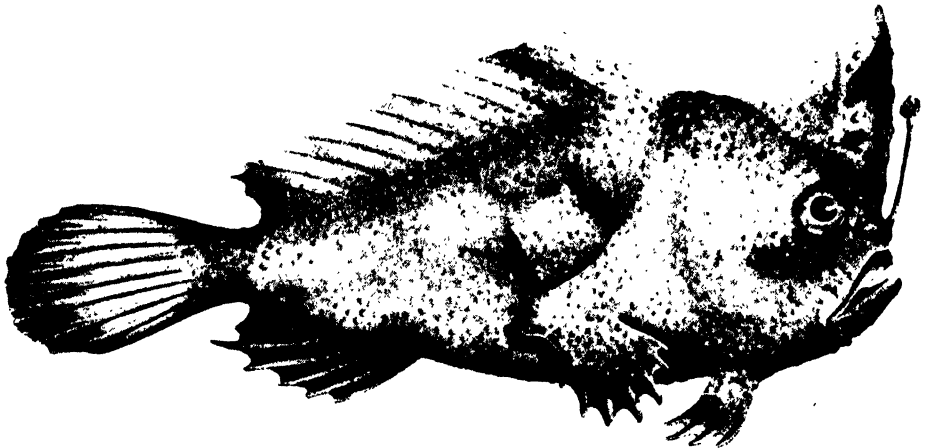


Fig. 304. *Sympterichthys verrucosus*.



*Sympterichthys verrucosus* McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 76, pl. vii, fig. 3.

## ORDER PLECTOGNATHI.

### DIVISION SCLERODERMI.

#### FAMILY MONACANTHIDAE.

#### CANTHERINES Swainson, 1839 (nasutus).

#### CANTHERINES GRANULATUS Shaw (Rough Leather-jacket).

*Balistes granulata* Shaw, in White's Voy. N.S.W., 1790, p. 295, pl. xxxix, fig. 2.

*Monacanthus granulatus* Rich., Zool. Ereb. & Terr., 1816, p. 63, pl. xl, fig. 1, 2.

*Monacanthus granulatus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 243.

*Monacanthus perulifer* Cast., P.Z.S., Viet., i, 1872, p. 245.

*Monacanthus margaritifer* and *M. brunneus* Cast., *op. cit.*, ii, 1873, p. 80, 145.

*Monacanthus obscurus* Cast., Res. Fish. Aust., 1875, p. 51.

*Monacanthus sancti-joanni* Cast., P.L.S., N.S.W., ii, 1878, p. 246.

*Pseudomonacanthus granulatus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

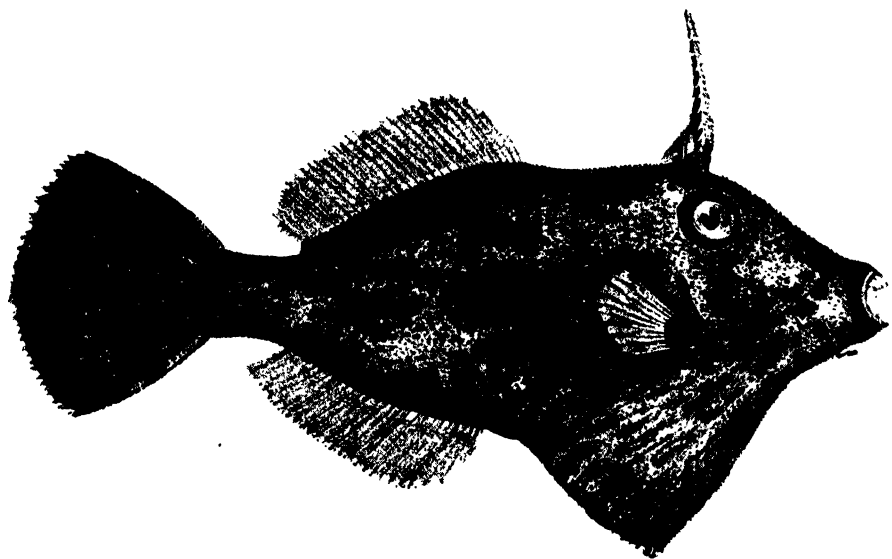


Fig. 305. *Cantherines granulatus*.

The Leather-jackets are excellent food, but require to be skinned before cooking. As their appearance is prejudicial they are often skinned before being exposed for sale.

**CANTHERINES HIPPOCREPIS** Quoy & Gaimard (Horseshoe Leather-jacket).

*Balistes hippocrepis* Quoy & Gaim., Voy. Uran. & Physic., 1824, p. 212.

*Aleuterius variabilis* Rich., Zool. Ereth. & Terr., 1846, p. 67, pl. liii, fig. 1-7.

*Monacanthus hippocrepis* Holl., Ann. Sci. Nat. (4), ii, 1854, p. 338; McCoy, Prod. Zool. Viet., dec. xiii, 1886, pl. cxxv; Ogil., Edib. Fish. N.S.W., 1893, p. 194, pl. xlviii.

*Pseudomonacanthus hippocrepis* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

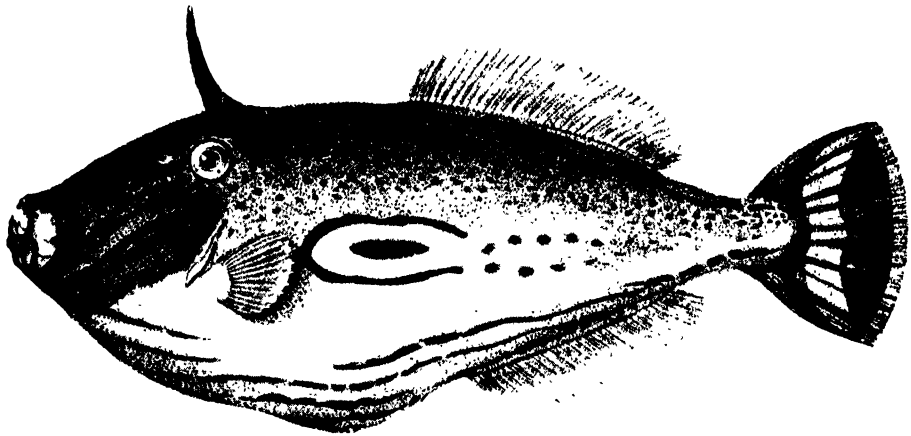


Fig. 306. *Cantherines hippocrepis*.

A large and well-flavoured species, reaching a length of 18 inches.

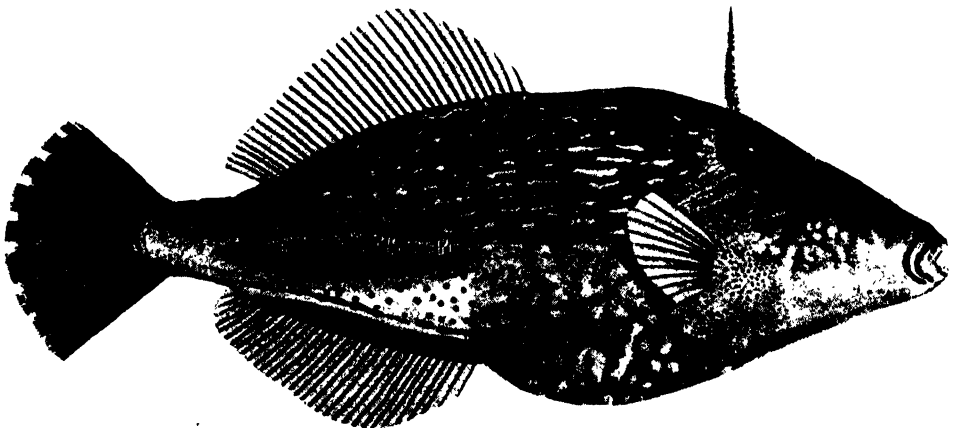
**CANTHERINES BROWNII** Richardson ('Toothbrush Leather-jacket')

Fig. 307. *Cantherines brownii*.

*Alcutterus brownii* Rich., Zool. Ereb. & Terr., 1846, p. 68.

*Monacanthus linco-guttatus* Holl., Ann. Sci. Nat. (4), ii, 1854, p. 352.

*Monacanthus brownii* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 249; McCoy, Prod. Zool. Viet., dec. xiii, 1886, pl. cxxiv.

*Monacanthus yagoi* Cast., P.L.S., N.S.W., ii, 1878, p. 245.

The patch of bristles on each side of the tail is responsible for the common name.

**CANTHERINES AYRAUDI Quoy & Gaimard (Yellow Leather-jacket).**

*Balistes ayraud* Quoy & Gaim., Voy. Uran. & Physic., 1824, p. 216, pl. xlvii, fig. 2.

*Alcutteres velutinus* Jenyns, Voy. Beagle, iii, 1842, p. 157.

*Monacanthus vittatus* Rich., Zool. Ereb. & Terr., 1846, p. 66.

*Monacanthus frauenfeldii* Kner, Reise Novara, 1867, p. 397.

*Monacanthus ayraudi* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 244; Ogil., Edib. Fish. N.S.W., 1893, p. 196.

*Pseudomonacanthus ayraudi* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56; Roughley, Fish. Aust., 1916, p. 188, pl. lxvi.

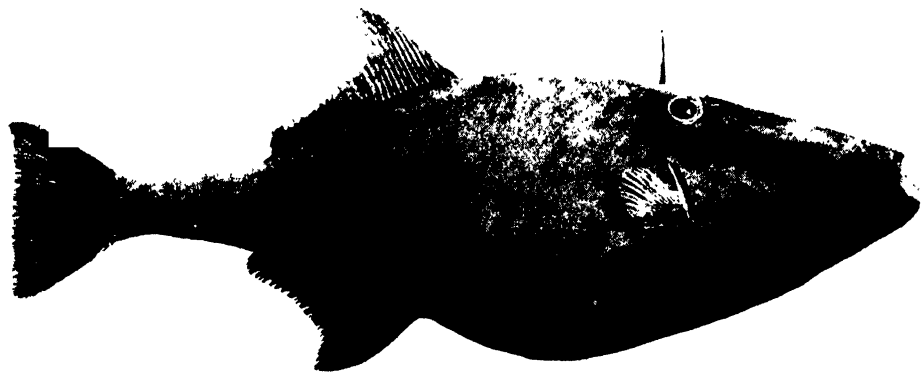


Fig. 308. *Cantherines ayraudi*.

Our largest and most important species, attaining a length of nearly 2 feet.

**CANTHERINES VITTIGER Castelnau.**

*Monacanthus vittiger* Cast., P.Z.S., Viet., ii, 1873, p. 81.

**CANTHERINES GUNTHERI Macleay.**

*Monacanthus peronii* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 249 (not Holl.).

*Monacanthus guntheri* MacL. P.L.S., N.S.W., vi, 1881, p. 314.

*Pseudomonacanthus guntheri* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

**CANTHERINES PERONII** Hollard (Banded Leather-jacket).

*Monacanthus peronii* Holl., Ann. Sci. Nat. (4), ii, 1854, p. 356, pl. xiii, fig. 8;  
McCoy, Prod. Zool. Viet., dec. xv, 1887, pl. cxliii.

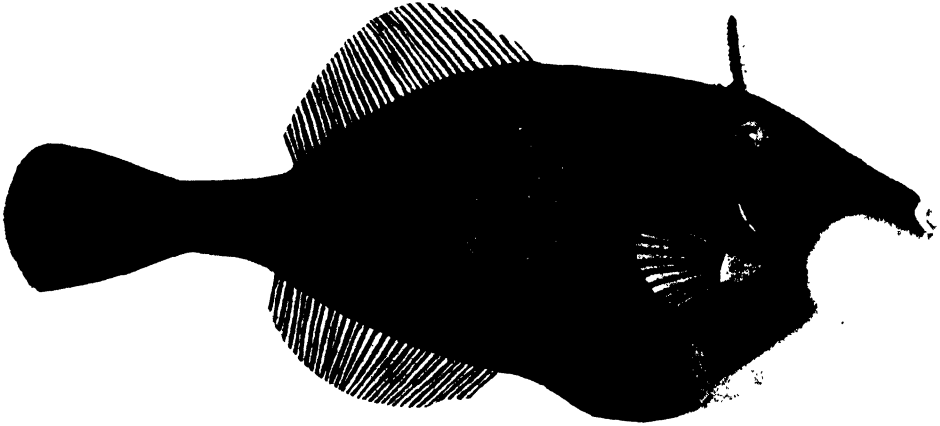


Fig. 311. *Cantherines peronii*.

**CANTHERINES MULTIRADIATUS** Günther.

*Monacanthus multiradiatus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 248.

**CANTHERINES SPILOMELANURUS** Quoy & Gaimard (Bridled Leather-jacket).

*Balistes spilomelanurus* Quoy & Gaim., Voy. Uran. & Physic., 1824, p. 217.  
*Aluterius paragaudatus* Rich., Zool. Ereb. & Terr., 1846, p. 66, pl. xxxix, fig. 1-4.

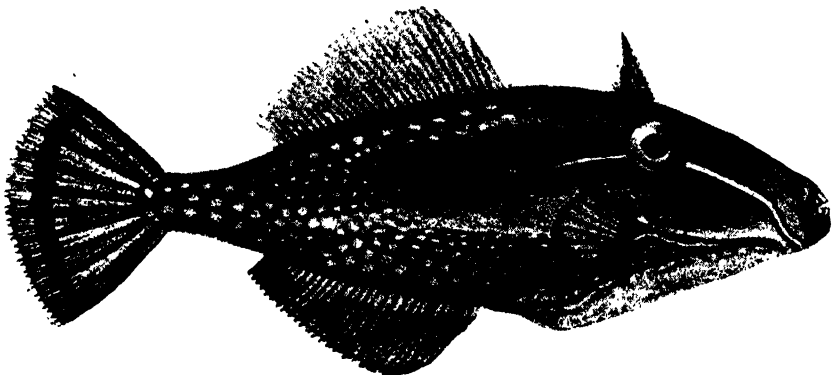


Fig. 313. *Cantherines spilomelanurus*.

*Monacanthus spilomelanurus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 250.

*Pseudomonacanthus spilomelanurus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

**CANTHERINES SETOSUS** Waite (Velvet Leather-jacket).

*Monacanthus setosus* Waite, Mem. Aust. Mus., iv, 1899, p. 91, pl. xvi.

*Pseudomonacanthus setosus* Waite, Mem. N.S.W. Nat. Club., ii, 1904, p. 56.

*Cantherines setosus* Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 472, pl. xiv.

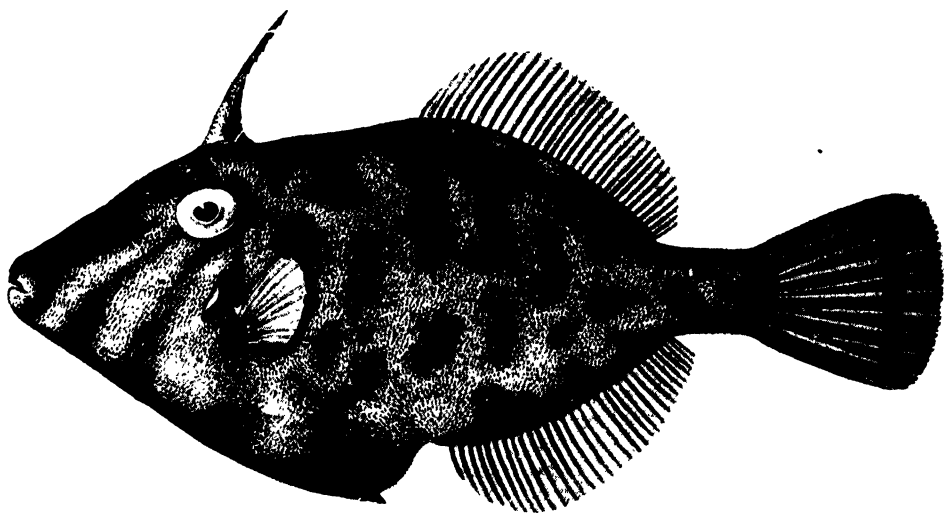


Fig. 314. *Cantherines setosus*.

The Leather-jackets are elsewhere called Trigger-fishes. The barbed spine can be locked erect; it can be released at will, or by the fisherman depressing the small second spine, which acts as a trigger.

**CANTHERINES MOSAICUS** Ramsay & Ogilby (Mosaic Leather-jacket).

*Monacanthus mosaicus* Rams. & Ogil., P.L.S., N.S.W. (2), i, 1886, p. 5; Waite, Mem. Aust. Mus., iv, 1899, p. 93, pl. xvii, fig. 1.

*Pseudomonacanthus mosaicus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

*Cantherines mosaicus* McCull., Endeavour Res., iii, 1915, p. 170, pl. xxxvii, fig. 1. 2

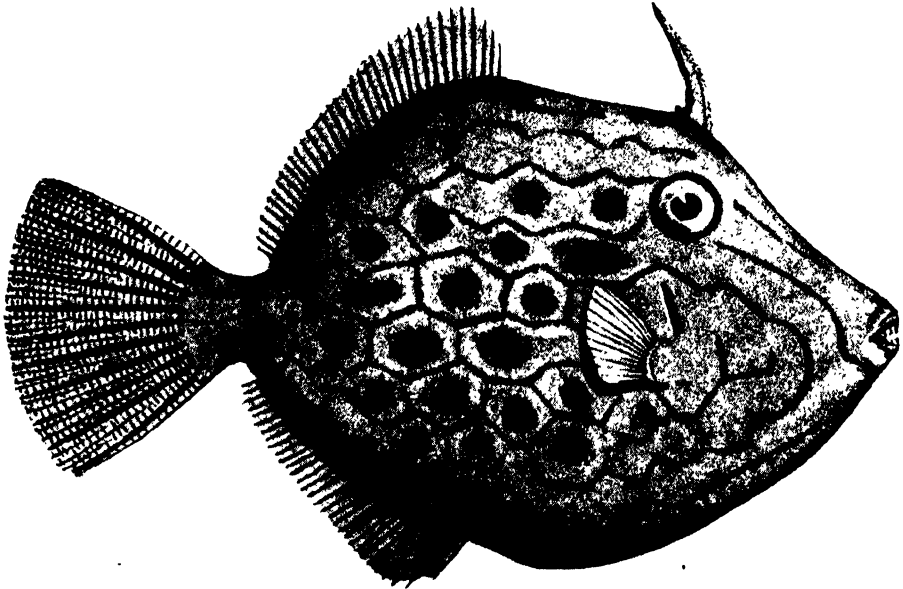


Fig. 315. *Cantherines mosaicus*.

The mosaic-like markings, whence the fish derives its name, are largely lost in adult life.

**BRACHALUTERES** Bleeker, 1866 (*trossulus*).

**BRACHALUTERES TROSSULUS** Richardson (Little Leather-jacket).

*Alceterius trossulus* Rich., Zool. Ereb. & Terr., 1846, p. 68, pl. xl, fig. 5, 6; Holl., Ann. Sci. Nat. (4), iv, 1855, p. 6, pl. i, fig. 1.

*Brachaluteres trossulus* Bleek., Ned. Tyds. Dierk., iii, 1866, p. 13.

*Monacanthus trossulus* and *M. oculatus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 234, 235.

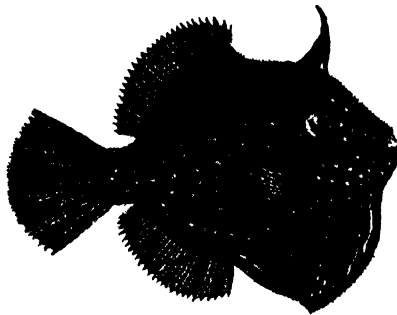
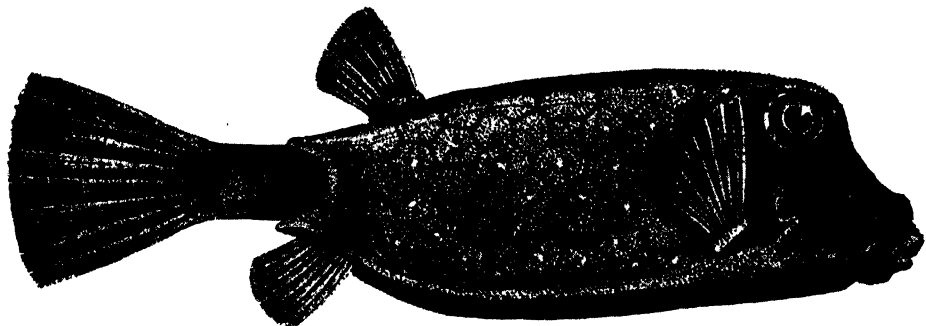


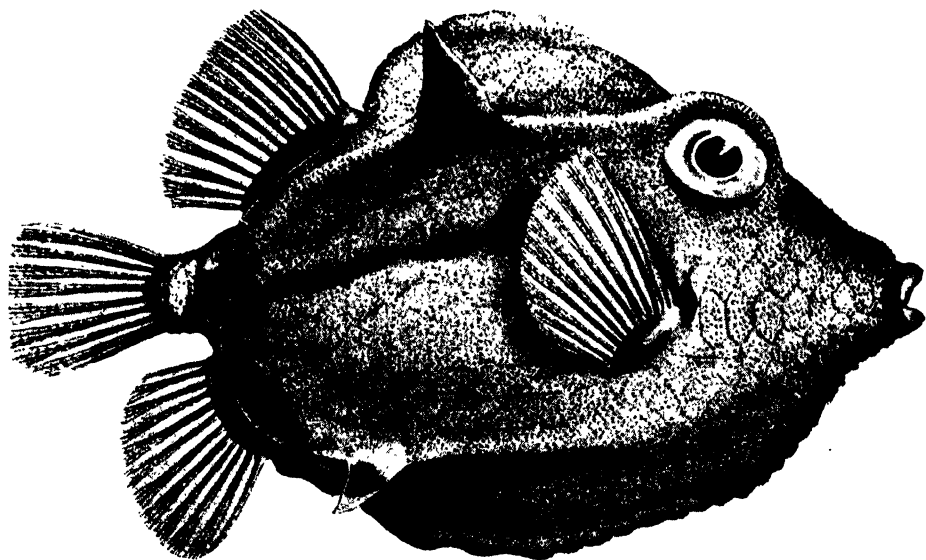
Fig. 316. *Brachaluteres trossulus*.

The figure represents the natural size of this species.

## FAMILY OSTRACIONTIDAE.

**OSTRACION** Linnaeus, 1758 (cubicus=tuberculatum).**OSTRACION TUBERCULATUM** Linnaeus (Box-fish).*Ostracion tuberculatus* and *O. cubicus* Linn., Syst. Nat. (ed. x), 1758, p. 331, 332.*Ostracion cubicus* Day, Fish. India, 1878, p. 696, pl. clxxxi, fig. 3 (syn.).Fig. 317. *Ostracion tuberculatum*.

The scales are modified to form a rigid carapace; parts around the gill-openings and bases of the fins are exposed to permit of breathing and swimming.

**CAPROPYGIA** Kaup, 1855 (unistriata).**CAPROPYGIA UNISTRIATA** Kaup.*Capropygia unistriata* Kaup, Arch. f. Naturg., xxi, 1855, p. 220; McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 478, pl. xvi.Fig. 318. *Capropygia unistriata*.

**ANOPLOCAPROS Kaup, 1855 (grayi=lenticularis).****ANOPLOCAPROS LENTICULARIS Richardson.**

*Ostracion lenticularis* Rich., P.Z.S., 1841, p. 21.

*Anoplocapros lenticularis* Kaup, Arch. f. Naturg., xxi, 1855, p. 221; McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 479, pl. xvii.

*Anoplocapros grayi* Kaup, *loc. cit.*

*Aracana lenticularis* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 268; Waite, Mem. Aust. Mus., iv, 1899, p. 95, pl. xvii, fig. 2 and pl. xviii.

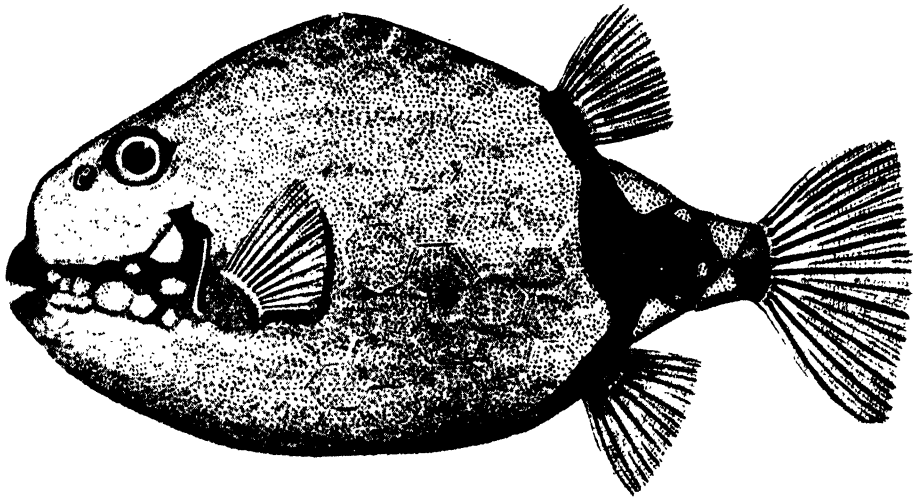


Fig. 319. *Anoplocapros lenticularis*.

**ANOPLOCAPROS GIBBOSUS McCulloch & Waite.**

*Anoplocapros gibbosus* McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 480, pl. xviii.



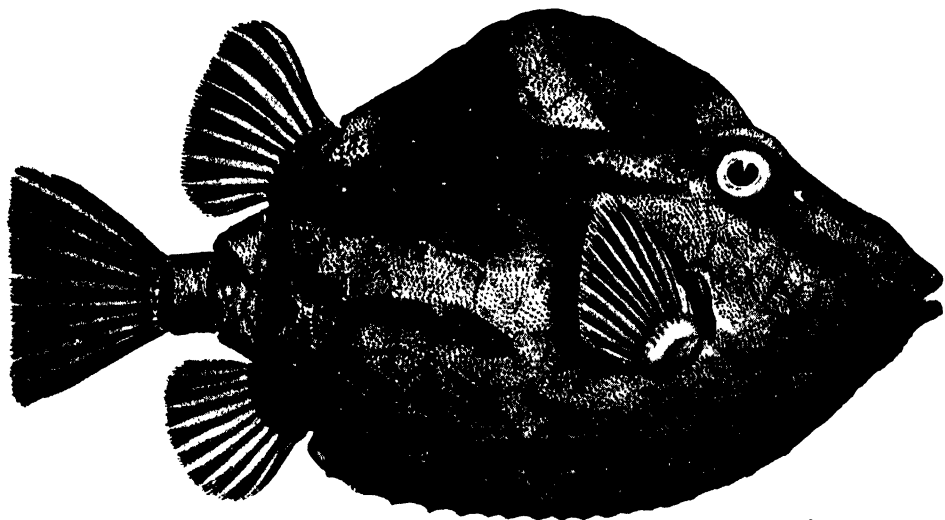


Fig. 320. *Anoplocapros gibbosus*.

**ARACANA** Gray, 1838 (*ornata*).

**ARACANA ORNATA** Gray (Common Cow-fish).

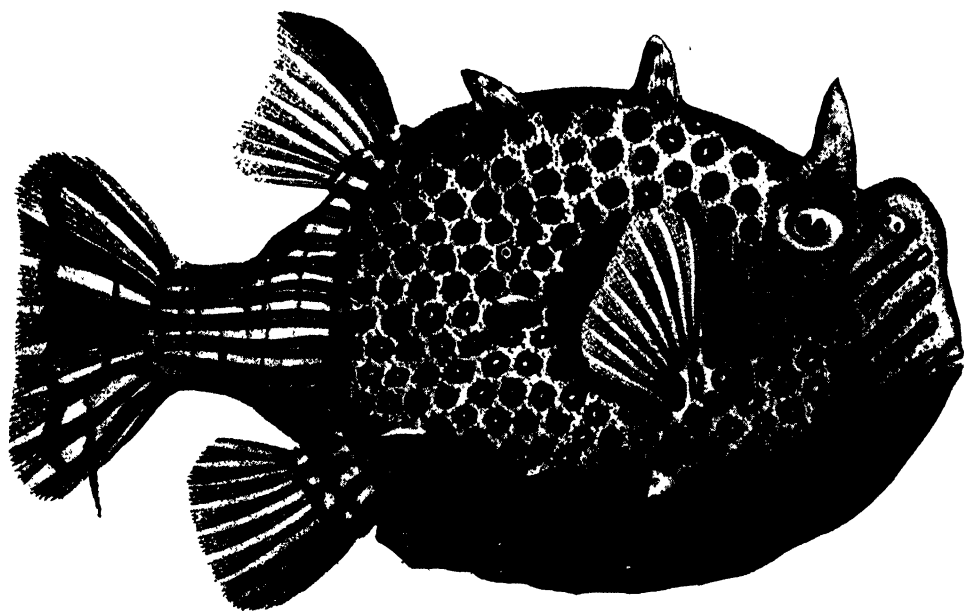


Fig. 321. *Aracana ornata*.

*Aracana ornata* Gray, A.M.N.H., i, 1838, p. 110; Rich., P.Z.S., 1840, p. 27 and T.Z.S., iii, 1849, p. 165, pl. x, fig. 2; McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 489, pl. xxiv.

Members of this genus differ from the other box fishes in having spines on the head, suggesting the horns of a cow.

### ARACANA AURITA Shaw.

*Ostracion auritus* Shaw, Nat. Misc., ix, 1798, pl. cccxxxviii and Gen. Zool., v, 1804, p. 429, pl. clxxiii.

*Aracana aurita* Gray, Ill. Ind. Zool., 1829, pl. xcviii, fig. 2 and A.M.N.H., i, 1838, p. 110; Rich., P.Z.S., 1840, p. 27 and T.Z.S., iii, 1849, p. 160, pl. ix, fig. 1, 2; Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 46; McCull & Waite, T.R.S., S.A., xxxix, 1915, p. 484, pl. xx (syn.).

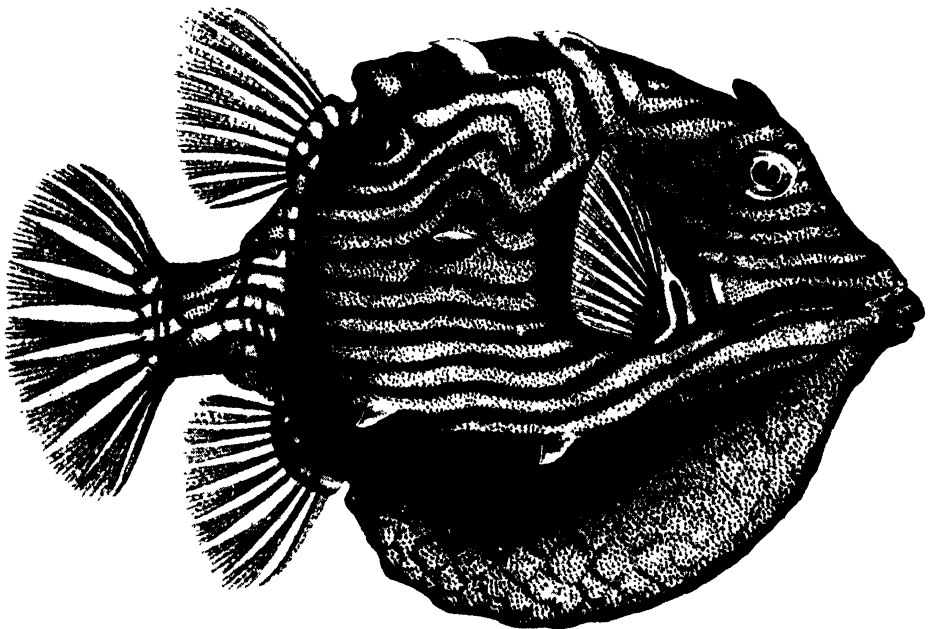


Fig. 322. *Aracana aurita*,

**ARACANA SPILOGASTRA Richardson.**

*Aracana spilogaster* Rich., P.Z.S., 1840, p. 27 and T.Z.S., iii, 1849, p. 163, pl. x, fig. 1; Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 47.  
South Australian specimens are referred to a variety, as below.

**var. ANGUSTA McCulloch & Waite.**

*Aracana spilogaster* var. *angusta* McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 488, pl. xxiii.

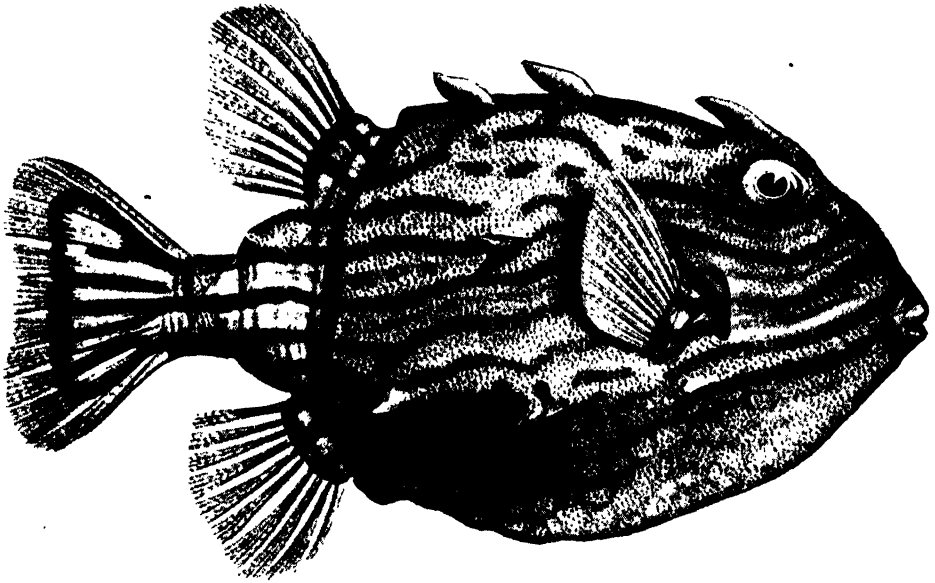


Fig. 323. *Aracana spilogaster*, var. *angusta*.

**ARACANA FLAVIGASTRA Gray.**

*Aracana flavigaster* Gray, A.M.N.H., i, 1838, p. 110; Rich., P.Z.S., 1840, p. 27 and T.Z.S., iii, 1849, p. 164, pl. xi, fig. 1; McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 491, p. xxv (syn.).

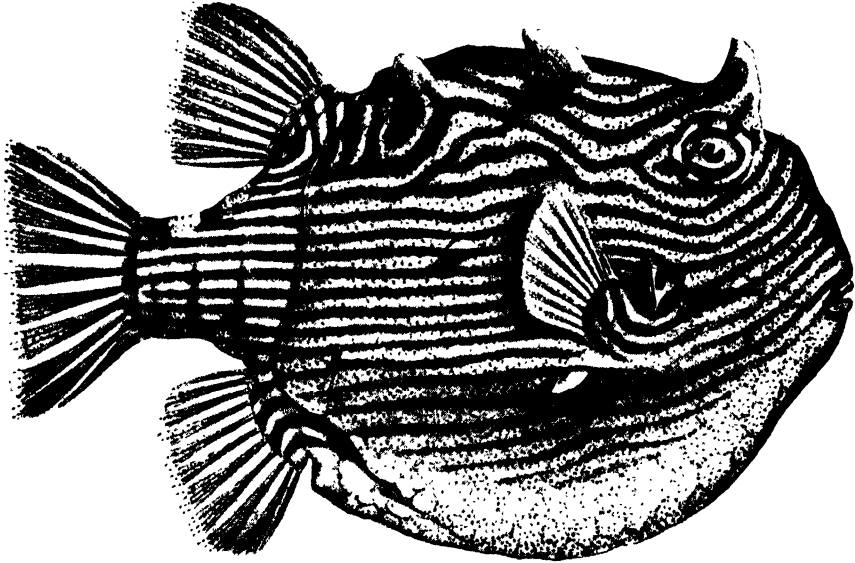


Fig. 324. *Aracana flavigastra*.

DIVISION G Y M N O D O N T E S .

FAMILY TETRAODONTIDAE.

**TETRAODON** Linnaeus, 1758 (testudineus).

**TETRAODON TETRAGONUS** Forster (Silver Toado).

*Tetraodon tetragonus* Forst., in Gmel., Syst. Nat. (ed. xiii), 1788, p. 1444.

*Tetraodon sceleratus* Gmel., loc. cit.

*Tetraodon argenteus* Lacep., Ann. Mus. Hist. Nat., 1804, p. 211, pl. lviii, fig. 2;

Bleek., Atl. Ichth., v, 1865, p. 64, pl. ccix, fig. 1.

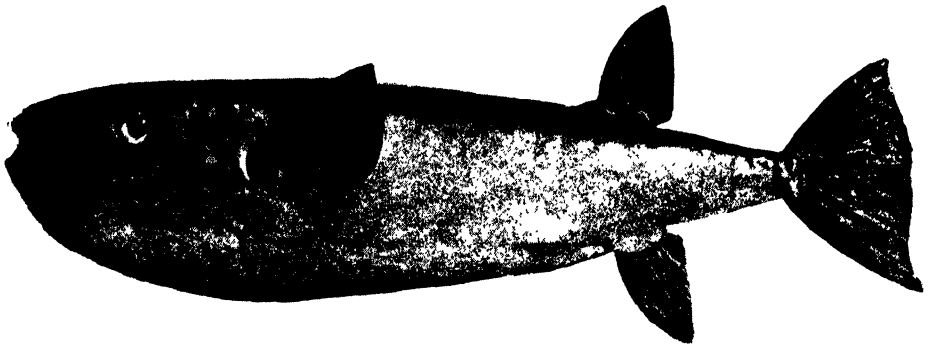


Fig. 325. *Tetraodon tetragonus*.

*Tetrodon argyropleura* Benn., Proc. Comm. Zool. Soc., ii, 1832, p. 184.

*Spheroides sceleratus* Jord. & Snyder, P.U.S. Nat. Mus., xxiv, 1901, p. 234 (syn.).

The Toados are not edible, and certain species are at times poisonous.

**TETRAODON RICHEI Freminville** (Common Toado).

*Tetrodon richiei* Frem., Nouv. Bull. Philom., iii, 1813, p. 250, pl. iv, fig. 2.

*Gastrophysus richiei* Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 44, fig. 3.

*Amblyrhynchotus richiei* Bibr., Rev. Zool., 1855, p. 280.

*Spheroides richiei* Jord. & Snyder, P.U.S. Nat. Mus., xxiv, 1901, p. 248.

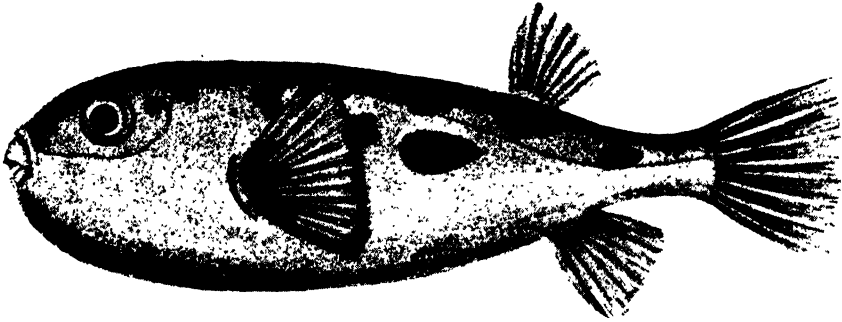


Fig. 326. *Tetraodon richiei*.

The Tetraodons are elsewhere known as Puffers and Swell-fishes, names given in allusion to the habit of distending their bodies with water or air.

**TETRAODON LIOSOMUS Regan.**

*Spheroides liosomus* Regan, A.M.N.H. (8). iv, 1909, p. 439.

**TETRAODON ARMILLA Waite & McCulloch** (Ringed Toado).

*Tetraodon armilla* Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 475, pl. xv.

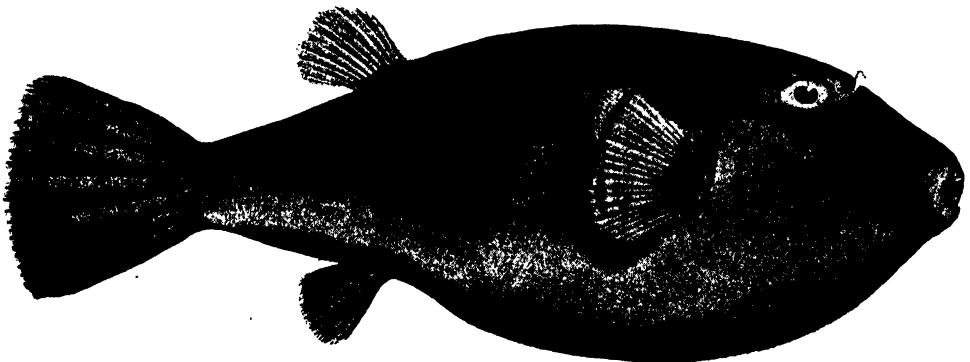


Fig. 328. *Tetraodon armilla*.

## FAMILY DIODONTIDAE.

**DIODON** Linnaeus, 1758 (hystrix).**DIODON HOLOCANTHUS** Linnaeus (Porcupine Fish).

*Diodon holocanthus* Linn., Syst. Nat. (ed. x), 1758, p. 335.

*Diodon liturosus* Shaw, Gen. Zool., v, 1806, p. 436.

*Diodon spinosissimus*, *D. novemmaculatus*, *D. sermaculatus*, *D. multimaculatus* and *D. quadrimaculatus* Cuv., Mem. Mus. Hist. Nat., iv, 1818, p. 134..

*Diodon melanopsis* Kaup., Wiegmann Arch., 1855, p. 228.

*Paradiodon novemmaculatus* and *P. quadrimaculatus* Bleek., Atlas Ichth., v, 1865, p. 57, 58, pl. cexi, fig. 3 and cexii, fig. 2.

*Diodon maculatus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 307.

**CHILOMYCTERUS** Bibron, 1846 (reticulatus).**CHILOMYCTERUS JACULIFERUS** Cuvier (Javelin Fish).

*Diodon jaculiferus* Cuv., Mem. Mus. Hist. Nat., iv, 1818, p. 130, pl. vii.

*Chilomycterus jaculiferus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 313; Waite, Mem. Aust. Mus., iv, 1899, p. 98.

*Dicotylichthys jaculiferus* Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 58.

**ATOPOMYCTERUS** Bleeker, 1865 (nychthemerus).**ATOPOMYCTERUS NICHTHEMERUS** Cuvier (Porcupine Fish).

*Diodon nichthemerus* Cuv., Mem. Mus. Hist. Nat., iv, 1818, p. 135, pl. vii, fig. 5; Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 45.

*Atopomycterus nychthemerus* Bleek., Atlas Ichth., v, 1865, p. 49; Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 315.

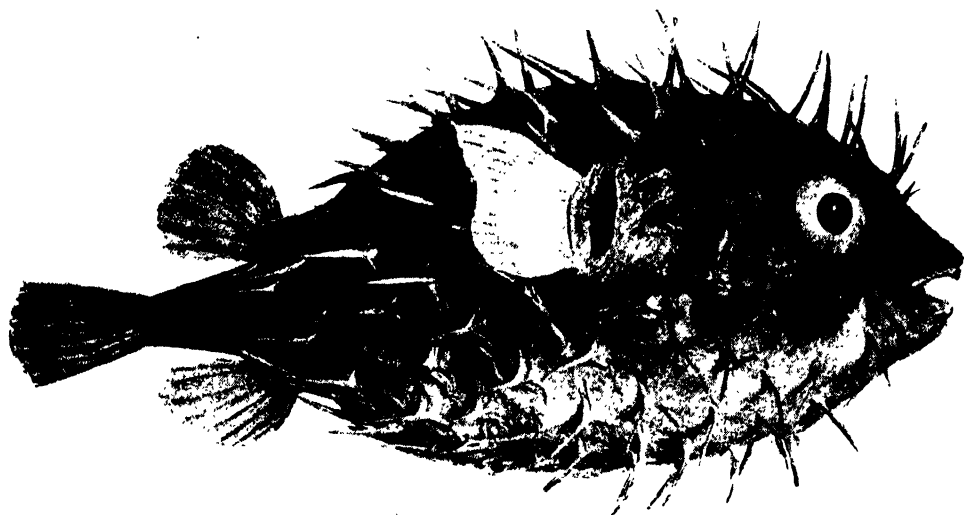


Fig. 331. *Atopomyxerus niebthemerus*.

The names of the genera *Tetraodon* and *Diodon* are derived from the characters of the dentition, the teeth forming a beak, like that of a turtle. In the *Tetraodons* each jaw is divided in the middle, four teeth being thus produced: in the *Diodons* the beak is undivided.

### FAMILY MOLIDAE.

**MOLA** Koelreuter, 1766 (*aculeata*=*mola*).

**MOLA MOLA** Linnaeus (Sunfish).

*Tetraodon mola* Linn., Syst. Nat. (ed. x), 1758, p. 334.

*Mola aculeata* Koelr., Nov. Comm. Acad. Petropol., x, 1766, p. 337, pl. viii, fig. 2, 3.

*Mola mola* Linck., Mag. Neues. Physik. u. Naturg., Gotha, 1790, p. 37; Jord. & Everm., Bull 47, U.S. Nat. Mus., ii, 1898, p. 1753 (syn.); Waite, Trans. N.Z. Inst., xlv, 1913, p. 223, pl. ix.

*Orthragoriscus mola*, Bl. & Schn., Syst. Ichth., 1801, p. 510.

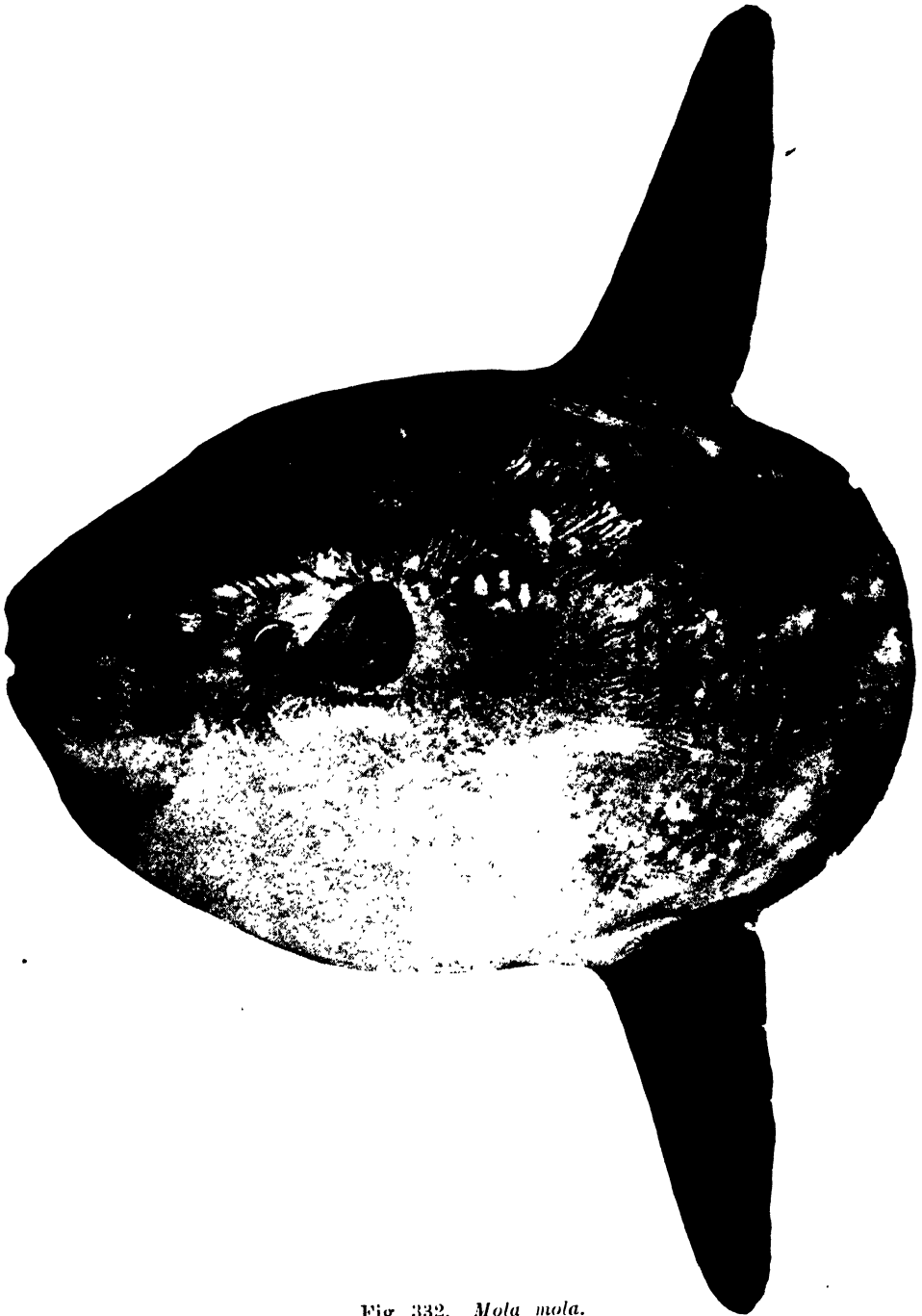


Fig. 332. *Mola mola*.

An enormous pelagic fish; examples have been taken weighing over 16 cwt.



**Note.** The majority of the illustrations are smaller than the adult fishes they represent: those numbered as follows are, however, larger than in nature:

Fig. 1, 55, 56, 62, 63, 78, 79, 80, 81, 84, 91, 94, 95, 118, 119, 121, 122, 123, 141, 150, 230, 233, 234, 235, 237, 240, 244, 251, 252, 253, 300, 301, 302, 304.

**Corrections.** Page 5, line 15, after *Cyclostomata* read *Plagiostomi*.  
Page 46, line 2, for Family *Siluridae* read *Plotosidae*.

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**Note.** Page 5, line 3. A reissue of part i of Mr. McCulloch's "Check-list of the Fish and Fish-like Animals of New South Wales," together with part ii (Elopidae to Sciaenidae) was published on April 11th, 1921, too late to be noticed in the text.

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**Corrections.** Page 5, line 5, for 1880 read 1890.

Page 144, delete the note under *Scomber colias* which refers to *Parapercis colias*, a species not found in Australia.

Page 148, line 1. Mr. McCulloch informs me that the genus and species should stand as

**CALLOGOBIUS** Bleeker, 1874 (hasseltii).

**var. MUCOSUS** Günther.

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# TWO ZIPHIOD WHALES

## NOT PREVIOUSLY RECORDED FROM SOUTH AUSTRALIA.

By EDGAR R. WAITE, F.L.S., DIRECTOR, S.A. MUSEUM.

Plates ii-iii.

### 1. MESOPLODON LAYARDII Gray.

*Ziphius layardii* Gray, Proc. Zool. Soc., 1865, p. 358, fig. a, b, c.

It is generally conceded that of the species of *Mesoplodon*, the best characterized and best known is *M. layardii*.

It was, however, presumed familiarity with this species that led to its being passed over, when determination of a specimen, the subject of this note, was attempted.

First, looking at the teeth, they were seen to be small and flatly conical, with the ivory tip turned outwards and downwards in a most extraordinary manner: knowing nothing approaching this condition, other features, both of skull and vertebrae, were then investigated, but without satisfactory results. Then the solution flashes across the mind: the teeth were those of an immature *M. layardii*, the "apex" being the anterior edge of the summit of the future "strap," and the hinder corner the posterior margin of the summit. When once the condition was realized, confirmation was forthcoming. Krefft and Gray published an illustration of an almost identical tooth, but failing to realize its connection with the Strap-toothed Whale, described it as the type of a new genus and species. <sup>(1)</sup> The figure, however, scarcely does justice to the condition as seen in our example, of which reproductions from actual photographs are supplied. The description, by Turner, of another tooth will be referred to later. Advantage has been taken of the opportunity to give some general notes on the animal and its skeleton.

The whale was cast up on the beach near Kingston, in Lacepede Bay, in February 1919, its occurrence being reported by Mr. Norman B. Tindale. It was some time later before I was able to visit the scene, by which time the softening flesh had settled down, so that any hope that had been entertained of casting the animal was out of the question, Mr. R. Limb, the Museum Formator, having accompanied me with that end in view. The carcase had been somewhat mutilated, as usual in such cases, by visitors, but the pair of divergent throat grooves was appar-

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(1) Krefft & Gray, Ann. Mag. Nat. Hist. (4), vii, 1871, p. 368, fig.

ent. The colour, after the results of partial decomposition, was black above and somewhat lighter below, but in its then condition it supplied no indication of the markings of the species, as previously described and figured by me. <sup>(2)</sup> The two mandibular teeth did not seem to have erupted the gums, and were not found until searched for by cutting into the flesh. Unsuccessful search was made for the smaller teeth found embedded in the gums of some of the Ziphioid whales. During an adjournment made while securing the skeleton, the carcass was visited by gulls and portions of flesh carried off: pelvic bones, if present, were probably lost by such means, as no trace of them could be found; the suborbitals had also disappeared. The otherwise complete skeleton was taken to Adelaide and mounted by the Museum taxidermists, Messrs. O. and J. Rau. I am indebted to Mr. H. M. Hale for the photographs accompanying the paper.

The following measurements were made as the animal lay on the beach:

	ft.	in.	mm.
Total length to middle of tail flukes . . . .	15	3	4648
Tip of snout to eye . . . . .	2	3	686
Tip of mandible to vent . . . . .	10	2	3099
Tip of snout to origin of dorsal fin . . . . .	9	6	2895
Width of tail flukes . . . . .	3	2	965

The specimen was a male, and, as afterwards transpired, a relatively young example, a fact supported by the following observations:

The small size, 15 ft. 3 in., as against 19 ft. 2 in., the maximum recorded.

The general soft condition of the bones, which necessitated careful maceration.

The open sutures and unattached epiphyses of the bones, especially of the vertebrae.

The imperfectly developed teeth, and the absence of a bony mesorostral; a basal soft bony mesethmoid being, however, evident.

**Skull.** The skull is generally symmetrically formed, the anterior narial portion alone being twisted towards the left side. The lateral groove at the basal portion of the rostral, generally described as only slightly developed in the species, is quite a feature in this young example, but possibly becomes less pronounced as development proceeds; the posterior pit in which the groove terminates is shallow. The foramina for the exit of the branches of the 5th nerve lie in the same transverse line. Other characters of the skull may be ascertained from the accompanying photographs and following table of dimensions, made in accordance with Flower's measurements <sup>(3)</sup>:

(2) Waite, Rec. Cant. Mus., i, 1912, p. 326, pl. lxii.

(3) Flower, Trans. Zool. Soc., x, 1879, p. 424.

	mm.
Extreme length of cranium . . . . .	853
Length of rostrum (from the apex of the premaxilla to the middle of a line drawn between the anteorbital notches) . . . . .	574
From middle of hinder edge of palate (formed by the pterygoids) to apex of rostrum . . . . .	678
Greatest height of cranium from vertex to pterygoids . .	338
Breadth of cranium across superior margin of orbits . .	328
Breadth of cranium between zygomatic processes of squamosals . . . . .	256
Breadth between anteorbital notches . . . . .	197
Breadth of middle of rostrum . . . . .	68
Breadth of occipital condyles . . . . .	115
Premaxillae, greatest width behind anterior nares . . .	156
„ least width opposite anterior nares . . .	110
„ greatest width in front of anterior nares . .	111
Width of anterior nares . . . . .	50
Length of tympanic bone . . . . .	44
Greatest breadth of tympanic bone . . . . .	30
Mandible, length of ramus . . . . .	742
„ length of symphysis . . . . .	166
„ greatest vertical height of ramus . . . . .	113

The skull has been well figured by others, but I have not seen a truly anterior aspect illustrated. This is supplied in the accompanying photograph (fig. 2) and shows the peculiar deflection of the teeth from the axes of the snout. The illustration stated by Turner to be a front view of the skull is really an upper view.

**Teeth.** The teeth originate at the hinder part of the mandibular symphysis, but as during growth they are inclined strongly backwards they appear to have a still more posterior origin, an appearance increased by the fact that the apices approximate immediately before the frontal portion of the head. The teeth are band-like, the breadth of the band lying generally in the axis of the skull. In aged examples, as has been often stated, the teeth meet, or even cross <sup>(4)</sup> and limit the gape of the mouth, so that the method of feeding becomes a problem. It is, however, with the juvenile tooth that we are more nearly concerned. The shape of that supplied by the animal now under consideration is shown in the accompanying figure (fig. 6), the longer portion of the growing root being

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(4) Sutton, Proc. Zool. Soc., 1885, p. 440, fig. 7, 8.

directed forwards: the tooth is set so that at first it grows very divergently in relation to its fellow, thus well clearing the sides of the snout; the summits then converge, and finally meet or cross as mentioned. An early function of the ivory tip may be to cut the gum, which would, apparently, be opened on the outer side; were the function of the tip to end there, we might suppose that it would drop off, much as does the thorn on the beak of an embryo chick. When, during the growth of the tooth, the summit begins to curve obliquely over the snout, the tip of the tooth tends to assume a more erect position, until finally it becomes subvertical. The successive deposits of tooth matter at the root are well seen in the teeth in question, as shown in the figure, and are also illustrated in the drawing of Krefft and Gray.

Turner <sup>(5)</sup> gives a most exhaustive account of a young tooth—*younger than the one here described*—from which it would appear that it is not until a slightly later development that the enamel tip or denticle takes on a downward position. He describes the denticle as projecting outwards and slightly upwards; that is, of course, in relation to the shaft, fang, or strap, and is true when the shaft is but quite small, as in the "Challenger" example (fig. 15 and 16). As, however, the shaft grows in an outward curve the denticle becomes more and more deflected from the plane of the shaft, until the latter begins to grow straight, whence the curvature is changed, the strap curving inwards and ultimately over the beak, when, as before stated, the denticle assumes an erect position in relation to the vertical axis of the skull. The downward aspect of the denticle in a tooth of the age of that of the Kingston whale, when in position in the jaw, is relatively greater than when held with the shaft in a vertical position, because the direction of the root of the growing tooth, conforming to the slope of the mandible, is markedly outward. Turner states that the denticle projects from about the middle of the upper border of the fang. This is apparently correct only for a very young tooth, for what is the middle of the fang in a young example afterwards becomes the anterior apical corner of the strap. The angle at which the denticle projects after cutting the gum is thus indicated by the writer quoted: "It is set at such an angle to the shaft as to be directed away from the animal's snout, and towards the water in which it swims." Seeing that the whale may be presumed to be wholly immersed in water, this description is not very lucid; it was doubtless intended to convey the information that the denticle was directed horizontally. In our tooth, the direction when *in situ* is almost directly downwards. In Turner's figure 15, the tooth is illustrated as inclined backwards above, apparently to show the condition of the base, the "set" of the denticle being indicated in figure 16.

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(5) Turner, "Challenger" Report, i, Bones of Cetacea, 1880, p. 10, pl. ii, fig. 15, 16.

**Vertebrae, Ribs etc.** The number of vertebrae is as follows: Cervical 7, Dorsal 9, Lumbar 10, Caudal 20, the terminal nine being without processes. The first three cervicals are connected. The number of dorsals is generally set down as ten, in our specimen nine only possess articulations for the ribs, and we have but nine pairs of ribs; they were all certainly recovered. The first seven dorsal vertebrae bear zygapophyses. The lumbar are keeled below. The caudals are generally stated to be 19, we have 20; the total number of bones in the column is 46, thus agreeing with that assigned by others, the individual differences occurring in the relative counts of the dorsals and caudals.

The first perforated diapophysis is the 8th caudal: there are 11 chevrons, the first of which is composed of two separate bones.

*M. layardii* has a wide distribution in southern seas; in Australasia it is recorded from New Zealand and the Chatham Islands, Queensland, New South Wales, and now South Australia. It was originally described from Capetown, and the "Challenger" obtained it at the Falkland Islands.

## 2. MESOPLODON GRAYI Haast.

*Mesoplodon (Oulodon) grayi* Haast, Proc. Zool. Soc., 1876, p. 7 and 457.

The subject upon which the identification rests is the right mandibular ramus of a specimen found on the beach at Kingscote, Kangaroo Island, and forwarded to the Museum on April 26, 1910, by Mr. A. H. Anderson, Harbour Master. It was generically identified by Mr. F. R. Zietz and labelled "*Mesoplodon*, sp.?"

The tooth was *in situ* when found, but someone cut the bone away on the outside and the tooth can now be removed and replaced. It can be inserted on either face, but as it *fits* only in one of the two positions, the conditions as below described are assumed to be correct. The tip of the mandible is missing, so that no useful comparative dimensions can be supplied; the symphysial connection appears to have been unossified, excepting perhaps in its anterior portion; the tooth stands at the hinder part of the juncture, its greater portion being in advance of the posterior connection of the symphysis. It is erect in the jaw, but the general curve, in which the enamel portion or denticle participates, is gently inwards, and the extreme tip, for about 1 mm., is curved outwards. When removed from the jaw, the shape presented is that of a flattened cone, suddenly expanded below at about half its height, with the basal margin strongly bowed; if inverted and the denticular portion held between finger and thumb, the resemblance to some of the flabelliform corals is very striking. The tooth is hollow, the denticle included: the latter occupies about one-fourth the total height, and its sides all round pass evenly into the contour of the base.

The fact that such a small portion of the animal is available for examination renders determination somewhat uncertain, but a study of the literature seems to indicate that the ramus should be assigned to *Mesoplodon grayi* Haast. As the

tooth was undoubtedly functional, and as that of the female of the species is smaller and said not to cut the gum, the mandible under examination may be regarded as that of a male.

The jaw and tooth are illustrated on plate iii, fig. 7 and 8.

It is this species in which the presence of small teeth in the upper jaw of both sexes was demonstrated by von Haast.

This whale has been freely stranded on the Chatham Islands, and examples are also known from New Zealand and Patagonia. It is listed by Ogilby as from New South Wales, but has not been previously recorded from South Australia.

### PRINCIPAL REFERENCES.

Additional to Forbes, Proc. Zool. Soc., 1893, p. 227, 229.

#### **Mesoplodon layardii Gray.**

*Mesoplodon layardi* Flower, T.Z.S., viii, 1874, p. 211 and x, 1878, p. 416; Hector, T.N.Z. Inst., x, 1878, p. 341; Turner, Chall., Rep. i, 1880, p. 2-26, pl. i-iii; De Vis (Jaggard), P.R.S., Queensl., i, 1884, p. 58, and 1885, p. 174, pl. xix; Flower, List Cetacea, Brit. Mus., 1885, p. 11; Sutton, P.Z.S., 1885, p. 440, fig. 7, 8; Trimen, T.S.Afr. Phil. Soc., v, 1893, p. 295; Trouessart, Cat. Mamm., ii, 1898, p. 1067; Selater, Mamm. S. Afr., ii, 1901, p. 193, fig. 144; Waite, Rec. Cant. Mus., i, 1907, p. 326, pl. lxii; FitzSimons, Nature, July, 1907, p. 247, fig. 1, 2, and Knowledge, August, 1907, p. 173 and figs.

*Mesoplodon thomsoni*, Krefft, MS. in Ogil. Cat. Aust. Mamm., 1892, p. 71.

#### **Mesoplodon grayi Haast.**

*Mesoplodon bidens* Ven Ben., Mem. Cour. Acad. Belgique, 1888 (*vide* Trouessart).

### **Explanation of Plate ii.**

Fig. 1. Skeleton of *Mesoplodon layardii* Gray (one-tenth natural size).

### **Explanation of Plate iii.**

Fig. 2. Skull of *Mesoplodon layardii* Gray, from the front, showing the disposition of the mandibular teeth (one-sixth natural size).

Fig. 3. Skull, from behind (one-sixth natural size).

Fig. 4. Skull, from above (one-eighth natural size).

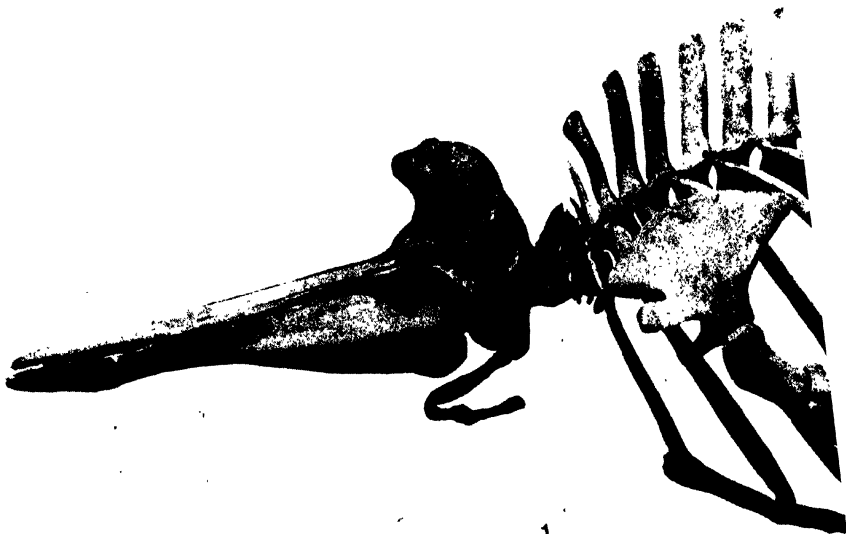
Fig. 5. Skull, from below (one-eighth natural size).

Fig. 6. Tooth of left ramus, outside aspect (five-sevenths natural size).

Fig. 7. Right ramus of mandible of *Mesoplodon grayi* Haast (one sixth nat. size).

Fig. 8. Tooth (five-sevenths natural size).

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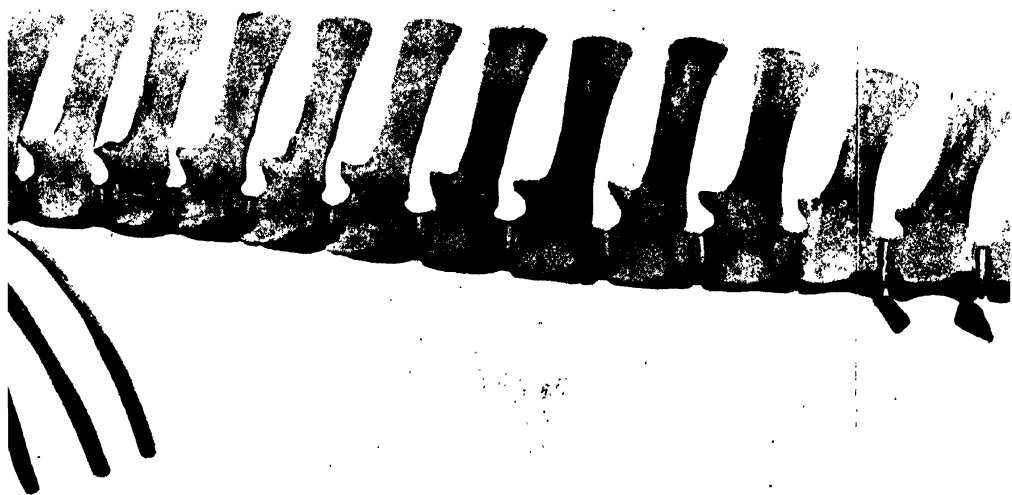
Fig. 4. Skull, from above (one-eighth natural size).

Fig. 5. Skull, from below (one-eighth natural size).

Fig. 6. Tooth of left ramus, outside aspect (five-sevenths natural size).

Fig. 7. Right ramus of mandible of *Mesoplodon grayi* Haast (one sixth nat. size).

Fig. 8. Tooth (five-sevenths natural size).



BEAKED WHALE (*Mesoplodon layardii* Gray.)





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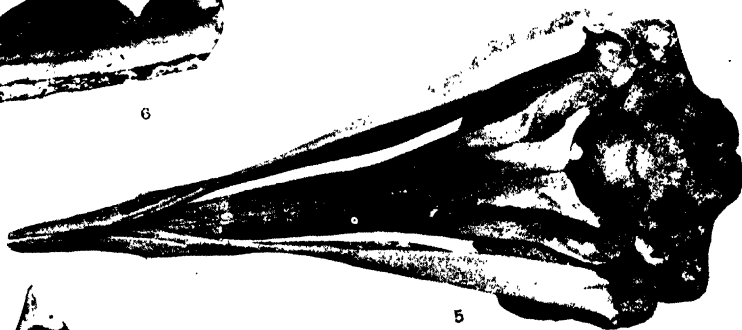
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BEAKED WHALES



# DESCRIPTION OF A NEW AUSTRALIAN FISH OF THE GENUS CONGIOPUS.

By EDGAR R. WAITE, F.L.S., DIRECTOR, S.A. MUSEUM.

Fig. 333.

THE genus *Congiopus* was founded by Perry, with *C. percatus* as type; its status being as below:

*Congiopus* Perry, Arcana or Mus. of Nat. Hist., 1811.

*Agriopus* Cuvier, Reg. Anim. (ed. 2), ii, 1829, p. 168.

*Cephalinus* Gronow, Cat. Fish, Brit. Mus. (ed. Gray), 1854, p. 159.

*Congiopodus* Gill, Mem. Nat. Acad. Sci. Wash., vi, 1893, p. 118.

I am unable to consult Perry's work, part of which appears to have been issued in 1810 and part in 1811. Marshall<sup>(1)</sup> does not seem to have seen the "Arcana," but lists the genus under the form *Congiopodus*; this mis-spelling and the erroneous date (1871) have been copied by most subsequent authors.

Cuvier was aware of Perry's paper, as noted in the "Histoire."<sup>(2)</sup>

In his "Genera of Fishes"<sup>(3)</sup> Jordan erroneously credits the editorship of Gronow's work to Albert Günther.

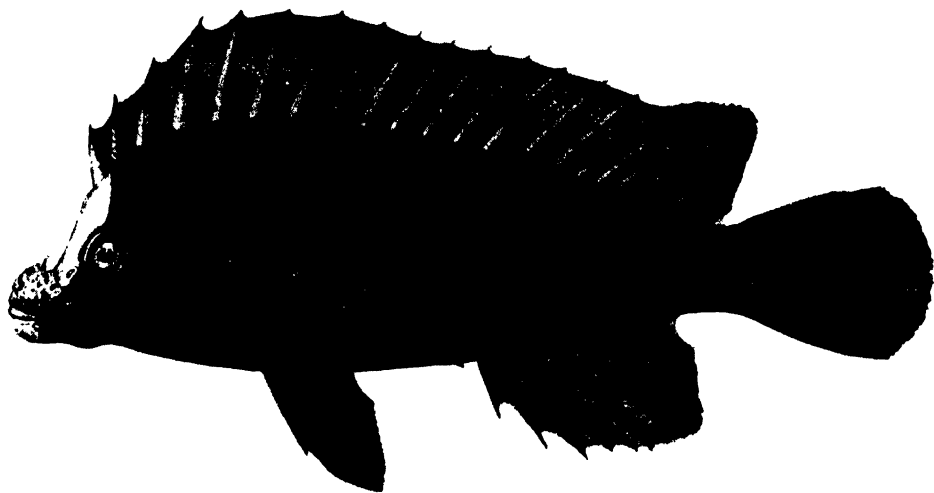


Fig. 333. *Congiopus leucometopon*.

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(1) Marshall, Nomencl. Zool., 1873, p. 71.

(2) Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 382, footnote.

(3) Jordan, Genera of Fishes, ii, 1919, p. 258.

Several species of the genus *Congiopus* (*Agriopus*) have been described from Chilian, South African, and Australian seas, but hitherto one only has been recognized from our waters. This (*C. leucopaccilus* Rich.) is known from South Australia and King George Sound, Southern Western Australia. A second Australian species is described as follows:

**CONGIOPUS LEUCOMETOPON sp. nov.**

D. xv, 9; A. iii, 6 (7); V. i, 5; P. 12 (11); C. 14.

Length of head 2.9, height of body 3.0, and length of caudal 3.6 in the length. Diameter of eye 4.8, interorbital space 6.1, and length of snout 3.0 in the head.

Head compressed, narrowed suddenly to the base of the snout, anterior profile very steep, snout bulbous and rugose, with a pair of short spines above directed upwards and backwards, and another on each side above the expanded distal end of the maxilla; mouth slightly oblique, the chin roughened like the snout, jaws equal; the maxilla does not reach the verticle of the eye. Four blunt processes on the margin of the preopercle and a weak flat spine imbedded on the opercular flap. The posterior nostril is on a level with, but in advance of, the lower edge of the eye; the anterior nostril is on a lower level. Gills four, no slit behind the last. Small pseudobranchiae present.

**Teeth.** Those in the jaws set in broad bands, each of which has a median suture, a triangular patch on the vomer, none on the palatines or tongue.

**Fins.** The first dorsal spine stands over the middle of the eye, the following ones are successively longer to the fourth, thence subequal, the longest being about half the length of the head; the soft rays form a lobe, higher than the spinous portion, the middle rays being 1.5 in the length of the head. The anal spines are strong, the third being equal in length to that of the longest dorsal, those of both fins are normally hidden in the membranes; the soft rays form a lobe similar to that of the dorsal; the hinder insertion of the fin is forward of that of the dorsal. The pectorals are large, extending to nearly above the first spine of the anal, with a broad base, the rays of the lower half with free tips. Ventrals pointed, extending to the vent and nearly as far as the pectorals, the spine strong. Caudal rounded, its peduncle compressed, the depth being one-third the height of the body.

Body compressed, naked, with vertical pliae or crease-like marks, each line passing through one of the lateral pores; the latter arise in advance of the opercular flap, and pass, with a lower curve than the dorsal profile, to the middle of the caudal peduncle; there are 28-30 pores in the series. The vertical marks were not apparent in the fresh specimen, but appeared after immersion in the

preservative; they are indicated in the drawing. A minute post-anal papilla is present.

**Colours.** Forehead, including the first dorsal spine, the front of the snout and tip of the chin white. This is followed by a jet black band, which arises narrowly at the base of the second spine, broadens, and passes obliquely through the eye across the hinder half of the snout, encircling the lower jaw behind the chin. The rest of the head, body, and fins are of deep coffee colour.

**Locality etc.** Described from two specimens, of which the smaller is marked as the type. The variation in the number of rays enclosed within brackets refers to the larger specimen; this measures 160 mm. in length, and was collected on the beach at Glenelg, South Australia, after a severe storm, by members of the Museum staff. The type, which measures 130 mm. in length, was taken at the same place and under similar conditions by Mr. H. M. Cooper. Type, No. F. 455.

This species differs from all other described members of the genus by having three spines in the anal fin. Many writers would regard this as justifying the erection of a new genus, and I shall be quite prepared to learn of the species being so erected. The number of genera constituted nowadays is overwhelming, and the practice must sooner or later fall under the weight of the burden cast upon it. One of the negative characters ascribed to the genus is the absence of preorbital spines, yet in *C. granulatus* from the Cape, three rough preorbital spines are described. Jordan and Starks <sup>(1)</sup> contrast their *Ocosia* with *Agriopus* and apparently inadvertently state that it differs therefrom in lacking the preopercular spine. In the description of the species *O. respa*, they describe the maxillary as reaching to below the middle of the eye, a statement at variance with the figure. This species agrees with *C. leucometopon* in having three anal spines, but its general alliance appears to be with *Tetraroge* rather than with *Congiopus*.

(1) Jordan & Starks, Proc. U.S. Nat. Mus., xxvii, 1904, p. 162, fig. 17.





## STUDIES IN AUSTRALIAN SHARKS, No. 4.\*

By EDGAR R. WAITE, F.L.S. DIRECTOR, S.A. MUSEUM.

Fig. 334.

### **PARASCYLLIUM FERRUGINEUM McCulloch.**

*Parascyllium ferrugineum* McCull., Endeavour Res., i, 1911, p. 7, pl. ii, fig. 2.

DURING a storm in August, 1920, when a quantity of flotsam was cast on to our ocean beaches, the little catshark here noticed was obtained alive. The buffeting it encountered probably induced it to leave its protecting egg-case somewhat prematurely, but, apart from enemies, it would probably have survived, as the yolk sac was well-nigh absorbed.

Its characters are well developed, so there is small difficulty in identifying it, at least generically. The large fifth gill-opening and the close proximity thereto of the fourth, is characteristic of the genus *Parascyllium*: in this young specimen the fourth slit is not at all apparent: it lies on the anterior edge of the fifth, and it can therefore be scarcely represented in a profile drawing. Presuming that it

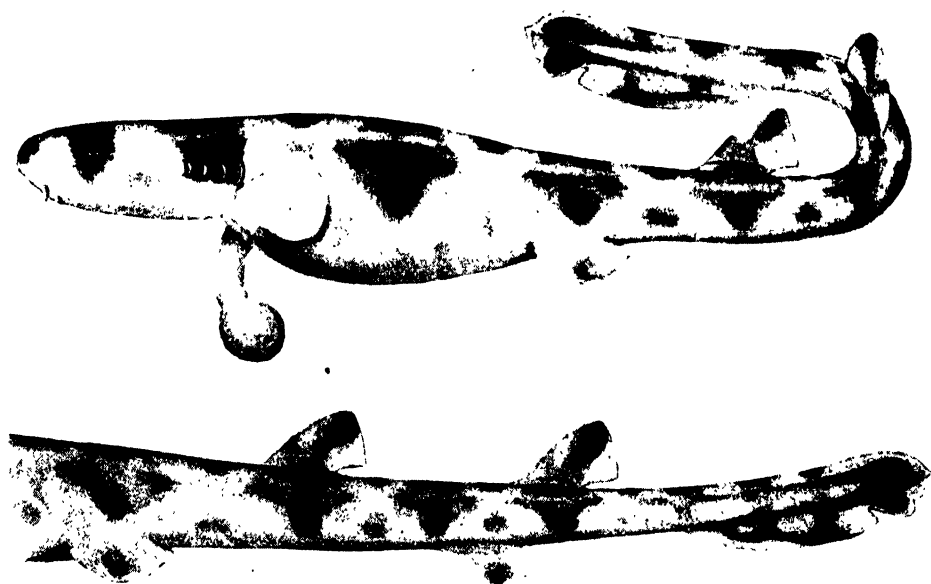


Fig. 334. *Parascyllium ferrugineum*.

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\* Previous numbers appeared in the "Records of the Australian Museum."

is one of the two species recorded from our waters, it may be assigned to *P. ferrugineum* McCull., hitherto known only from three examples, the type taken outside Port Philip Heads in November, 1909, another specimen obtained in the Australian Bight in 22 fathoms in September, 1914, and a third taken at Encounter Bay, 1919, and forwarded by Mr. H. Dutton. An illustration of the young specimen taken on the Glenelg beach is supplied for comparison with that published by Mr. McCulloch. Remembering the changes that take place with growth, no useful purpose would be served by making the usual comparative measurements, but it may be noted that the young shark is corporally well equipped for its advent of independent existence. As is usual, the umbilical vessels enter the body at the fore-end of the thorax, and in the specimen here considered, and as above mentioned, the contents of the yolk sac have been nearly absorbed. The spiracle lies close below the hinder corner of the eye.

The colour markings of the adult are indistinct; in the young they are very pronounced, and serve to show whence the adult pattern is derived. The nasal, ocular, and branchial bands are simple, but those that follow have each the form of a double diamond-shaped figure laid across the back; between each figure, on the dorsal line, is a large round black spot, and a fainter one below it. These spots, together with one on the lower point of each diamond and one on each fin, are evidently responsible for the smaller black spots of the adult into which they break up.

The accompanying illustration represents the young of natural size; the tail portion has been duplicated for more accurate comparison.

Length of specimen, 168 mm.

## RECORD OF A EUROPEAN MOLLUSC NOT PREVIOUSLY REPORTED FROM AUSTRALIA.

By SIR JOSEPH VERCO, M.D., F.R.C.S., HON. CURATOR IN MOLLUSCA.

MORE than fifty living examples of a bulimoid mollusc were sent to the South Australian Museum by the Department of Agriculture, having been received from Mr. Kieselbach of Mount Gambier.

They are quite unlike any pulmonate recorded from South Australia, but correspond with a European form. Mr. Charles Hedley, of the Australian Museum, Sydney, compared them with specimens of *Helicella ventricosa* from Egypt, and found they closely agreed. They are evidently an introduced form, not hitherto recorded for Australia.

The following is the bibliography of the species:

*Bulimus ventricosus* Draparnaud, Tab. des Moll., 1801, pl. iv, fig. 31, 32;

Deshayes, Anim. s. Vert. (ed. 2), viii, 1838, p. 235, No. 31.

*Helicella* (*Cochlicella* Risso, 1826) *ventricosa* Tryon, Man. Conch. (ser. 2),

Pulmonata, iv, 1888, p. 32, pl. vi, fig. 83-85, dimensions 9 mm. x 5.5 mm.;

Pilsbry, *op. cit.*, ix, 1894, p. 26=*H. ventrosa* auct, and *H. bulimoides* Moq.

**Locality.** (Tryon.) "Mediterranean Region, Canaries, Azores, and Bermuda (introduced)."

Our specimens reach 10 mm. x 5.0 or 5.5 mm, and so are slightly longer and relatively narrower than the European examples.



# UNDESCRIBED CRANE-FLIES (TANYDERIDAE AND TIPULIDAE) IN THE SOUTH AUSTRALIAN MUSEUM.

By DR. CHARLES P. ALEXANDER, URBANA, ILLINOIS.

Fig. 335, 336.

THE extensive collections of Australian crane-flies contained in the South Australian Museum have been kindly sent to me for determination by the Board of Governors. A considerable number of new species, distributed in many genera, were found to be included; of these genera, *Orimargula*, *Elephantomyia*, *Ceratocheilus*, *Epiphragma*, *Stibadocerella*, and *Phacelodocera* had never been recorded from the Australasian region. Most of the novelties were from localities in which little or no work had been done on the Tipulidae, such being Tasmania, the Dorrigo Tableland in New South Wales, Lord Howe and Norfolk Islands, and Bathurst and Melville Islands in North Australia. The writer's thanks are due to the various collectors of this unusually valuable series of Australian Tipuloidea, especially to the Museum Entomologist, Mr. Arthur M. Lea, who personally collected most of the material. The types of all the new species have been returned to the South Australian Museum, paratypes of some species represented by more than two individuals being preserved in the writer's collection.

**Venation.** The wing-venation of the species of crane-flies considered in the present report is interpreted in accordance with the principles of the Comstock-Needham system (fig. 335). The fundamentals of this system are briefly outlined here, the students being referred to more detailed accounts <sup>(1)</sup> for additional particulars.

The wing of an insect is composed of membranes traversed by a series of longitudinal veins extending from the base to the outer margin, and bound together at various points by cross-veins and deflections of the longitudinal veins, which form strong fusions at these places. There are six or seven longitudinal

(1) Comstock, John Henry. The Wings of Insects, 1918, p. 1-430.

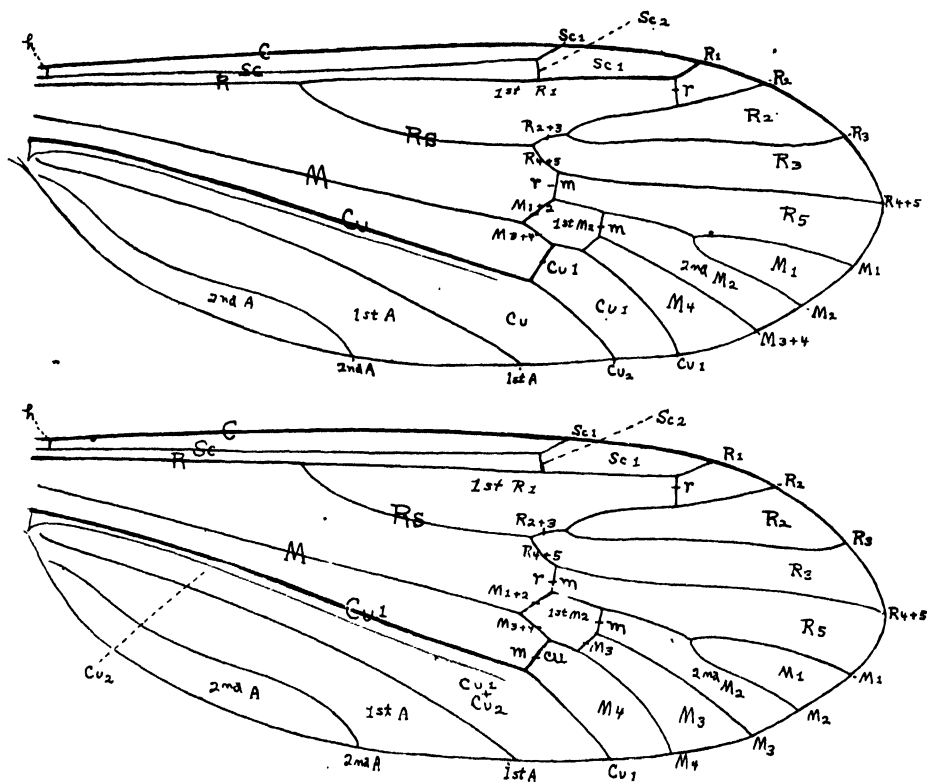
Needham, James George. Report of the entomologic field station conducted at Old Forge, New York, in the summer of 1905. New York State Entomologist. Report 23, 1908, p. 156-248.

Alexander, Charles Paul. The Crane-flies of New York. Cornell University Agricultural Experiment Station. Memoir 25, 1919, p. 860-869.

veins, named respectively from the front or anterior margin backward, Costa (C), Subcosta (Sc), Radius (R), Media (M), Cubitus (Cu), and the Anal veins. The longitudinal veins are always indicated by capital letters, followed by sub-numerals to indicate the number of the branch.

Costa (C) forms the anterior margin of the wing and is unbranched.

Subcosta (Sc) is a weak vein lying between costa and radius, forked once, usually near its tip, the anterior branch (Sc<sup>1</sup>) connecting with costa, the posterior branch (Sc<sup>2</sup>) connecting with radius. Sc<sup>2</sup> tends to migrate toward the wing-base and simulates a crossvein.



Wing-Venation of *Gynoptistia*, sp.

Fig. 335 (upper). Interpreted according to the Comstock-Needham system.

Fig. 336 (lower). Interpreted as modified by Tillyard.

A=anal veins.

C=costa.

Cu=cubitus

M=media.

R=radius.

Sc=subcosta.

h=humeral crossvein.

m=medial crossvein.

m-cu=medial-cubital crossvein.

r=radial crossvein.

r-m=radial-medial crossvein.

Rs=radial sector,

Radius (R) is typically five-branched. The principal branch ( $R^1$ ) runs parallel to the anterior margin, at about mid-length giving off a strong branch, the radial sector (Rs) or praefurca, which, in turn, is dichotomously twice forked. In most Tipulidae, the two posterior branches,  $R^1$  and  $R^5$ , are fused into a single branch,  $R^{4+5}$ .

Media (M) occupies the median area of the wing. Its behaviour is like that of the radial sector, being dichotomously twice forked. The upper fork carries the branches  $M^1$  and  $M^2$ , the lower fork carries the branches  $M^3$  and  $M^4$ . In the system used,  $M^3$  and  $M^4$  are interpreted as being fused,  $M^{3+4}$ , or, for convenience,  $M^3$  alone in the Limnobiinae.

Cubitus (Cu) is a powerful vein lying between media and the first anal vein; it is forked once, the anterior branch ( $Cu^1$ ) being united with the posterior branch of media either by direct fusion or by the short medial-cubital (m-cu) crossvein.

Behind cubitus are one or two simple veins, the anal veins (A).

There are five primary cross-veins, which are indicated by small letters: the humeral (h), in the base of cell C; radial (r), in cell  $R^1$ , connecting  $R^1$  with either  $R^{2+3}$  or  $R^2$  alone; radial-median (r-m), connecting the posterior branch of radius with the anterior branch of media; medial (m), connecting the upper fork of media with the posterior fork, and, if present, closing the discal cell (first  $M^2$ ); medial-cubital (m-cu) is present only in the generalized forms, being obliterated by the fusion of the anterior branch of Cu on the anterior branch or trunk of M.

The cells of the wing take their name from the veins immediately before or in front of them, as indicated by the accompanying figures. In the case of fused veins, the cell takes its name from the last element of the fusion.

Recently Dr. Tillyard<sup>(2)</sup> proposed an important modification of the Comstock-Needham system. This modification involves the medial and cubital fields, the principal features being shown on fig. 336. According to this interpretation, which, in the writer's opinion, is very probably the correct one, media is considered as having four persistent branches,  $M^3$  and  $M^4$  being separate; the latter branch corresponding to the branch  $Cu^1$  of the Comstock-Needham system. Cubitus is interpreted by Tillyard as having but a single primary branch,  $Cu^1$  corresponding to  $Cu^2$  of the Comstock-Needham system. In the Panorpid Complex, Tillyard holds that cubitus forks close to the wing-base, the posterior branch,  $Cu^2$  being semiatrophied and lying close behind the primary branch of cubitus.

(2) Tillyard, R. J. The Panorpid Complex. Part 3: The Wing-Venation. Proc. Linn. Soc. N.S. Wales, xlv, 1919, p. 533-718.



## FAMILY TANYDERIDAE.

**TANYDERUS Philippi, 1865.**

The genus *Tanyderus* includes eight described species, of which four are from the Australasian Region, although none had previously been discovered in Australia or Tasmania. The distinctions between *Tanyderus* and *Protoplasa* become less clearly defined with the constant accession of new forms, and it may become necessary to unite the two genera. In this latter case, the family name would become Macrochilidae or Protoplasidae.

**TANYDERUS AUSTRALIENSIS sp. nov. .**

Mouth-parts much longer than the head; antennae with fifteen segments general colouration dark brown; wings hyaline with three dark brown cross bands; veins conspicuously hairy; a supernumerary cross-vein in cell R<sup>4</sup>.

♀ Length, about 9 mm.; wing, 11 mm.; rostrum alone, 1.4 mm.

Mouth-parts conspicuous, produced into elongate stylets that are about twice as long as the head; palpi dark brown, elongate, subtending the blade-like parts. Antennae with only fifteen segments; scapal segments dark brown; flagella segments cylindrical, gradually decreasing in length from the basal to the terminal; verticils inconspicuous, those on the terminal segments slightly longer. Front slightly produced, dark brown, sparsely pruinose; vertex black, grey pruinose. Pronotum short, as in *T. beckeri* Riedel. Mesothorax discoloured brown, the median area of the praescutum darker brown. Pleura brown, indistinctly variegated with darker. Halteres yellow, the knobs abruptly dark brown. Legs with the coxae and trochanters dark brown; femora yellow, the tips broadly dark brown; tibiae brownish-yellow, the extreme bases and tips dark brown; tarsi light reddish-brown; legs short and comparatively hairy. Wings hyaline with three broad dark brown cross-bands; one basal; the second occupying the general level of the cord; the third band occupies the wing-apex; the basal area extends to the origin of Rs and to about one-third the length of cell second, there being a quadrate hyaline area in cell R near the base; the second area broadest at the anterior margin, extending very obliquely basad to include the apical third of cell second A; there are small hyaline areas along the costal margin of this band in cells C and Sc, before and just beyond the union of S with R; the third or apical band includes the outer ends of cells Sc<sup>1</sup> and R<sup>1</sup>; but a small basal portion of R<sup>2</sup>; the outer third of R<sup>3</sup>; the outer two-fifths of I this latter, however, interrupted by a conspicuous rectangular hyaline area before the end of the cell; more than the distal half of cell R<sup>5</sup> is darkened; the outer ends of cells first M<sup>2</sup>, M<sup>3</sup> and Cu<sup>1</sup> are darkened, and all of cells M<sup>1</sup> and second.

excepting a small hyaline area which occupies the base of  $M^1$  and covers the middle of cell second  $M^2$ ; anal angle yellowish; veins dark brown, more yellowish in the hyaline areas. Venation:  $Sc^1$  lacking;  $Sc^2$  ending in R before the level of the outer end of cell first  $M^2$ ; the tip of  $Sc^2$ , after fusing with R for a distance about its own length, breaks away and appears as a conspicuous oblique vein provided with macrotrichiae; origin of Rs far back near the wing-base, R before this origin being only about one-half of Rs; cell first  $M^2$  very long and narrow, lying far out in the membrane, vein  $M^3$  beyond it being less than one-half the length of cell first  $M^2$ ; basal deflection of  $M^2$  much longer than m; anal vein short and straight, cell A being relatively narrow; a single supernumerary cross-vein situated in cell  $R^4$  some distance beyond the level of the fork of  $R^{2+3}$ ; veins provided with long, conspicuous macrotrichiae. Abdomen discoloured; apical half of the tergites darker and more glabrous than the basal half. Valves of the ovipositor orange.

*Hab.* Tasmania: Southport. Type, I. 12134.

## FAMILY TIPULIDAE.

### DICRANOMYIA Stephens, 1829.

#### DICRANOMYIA PUNCTIPENNIS OCCIDENTALIS sub. sp. nov.

♂ Length, about 5.8 mm.; wing, 8 mm. ♀ Length, 8 mm.; wing, 9.3 mm.

Closely resembling typical *D. punctipennis* Skuse (South-eastern Australia), differing as follows:

Median praescutal stripe very narrowly and indistinctly split by a capillary pale line. Legs with the femora dark brown, only the bases narrowly brightened. Wings with the dark clouds on the radial and cubital forks scarcely apparent, the veins being dark brown throughout. Venation:  $Sc^1$  shorter than r-m. Abdomen dark brown, the sternites a little paler.

*Hab.* Western Australia: Warren River (W. D. Dodd). Type, I. 12135.

#### DICRANOMYIA INHONORA sp. nov.

General colouration grey, the praescutum with three brown stripes; fore femora yellow, the tips broadly blackened; middle and hind femora with an indistinct subterminal brown ring; wings whitish-subhyaline, with three conspicuous brown blotches along vein R before the stigma, these areas about as extensive as the interspaces.

♂ Length, 7 mm.; wing, 8.8 mm. ♀ Length, 6.5–8 mm.; wing, 8–9 mm.

Rostrum and palpi dark brown. Antennae dark brown; flagellar segments submoniliform. Head light grey. Mesonotal praescutum light grey with three dark brown stripes, the median stripe broad and conspicuous; scutal lobes brown;

remainder of the mesonotum grey. Pleura heavily grey-pruinose, brighter ventrally. Halteres short, pale. Legs with the coxae dark, sparsely pruinose; trochanters reddish-yellow; femora yellow, the tips of the fore femora broadly dark brown, on the other femora with a narrow subterminal ring instead of the dark apex; tibiae brownish-yellow, the tips narrowly darkened; tarsi brown, the terminal segments larger. Wings whitish subhyaline; stigma oval, greyish-brown; three conspicuous brown clouds along R before the stigma, the first at h, the third at the origin of Rs and the tip of Sc, these dark marks subequal in extent to the pale interspaces; paler grey clouds along the cord and outer end of cell first  $M^2$ ; tips of the anal veins and near midlength of vein first  $\Delta$  clouded; veins dark brown in the infuscated areas, more yellowish elsewhere. Venation: Sc short,  $Sc^1$  ending a short distance beyond the origin of Rs,  $Sc^2$  at the tip of  $Sc^1$ ; Rs about twice the deflection of  $R^{4+5}$ ; cell first  $M^2$  subquadrate; basal deflection of  $Cu^1$  before the fork of M; anal angle rather prominent. Abdomen dark brown, pruinose; sternites more yellowish, the subterminal sternites infuscated.

*Hab.* South Australia: Port Lincoln; Tasmania: King Island; Lord Howe Island (A. M. Lea). Type, I. 12136.

*D. inhonora* is apparently most closely related to *D. obscura* Skuse.

#### **DICRANOMYIA BREVIRAMA sp. nov.**

Head and rostrum brownish-yellow; antennal scape brownish-yellow, the flagellum dark brown; wings yellowish; Sc short, cell first  $M^2$  closed; abdominal tergites dark brown, the caudal margins narrowly pale.

♀ Length, 6 mm.; wing, 7.2 mm.

Rostrum and palpi light brownish-yellow. Antennal scape brownish-yellow; flagellum dark brown, the segments oval. Head brownish-yellow. Mesonotal praescutum yellow with a reddish sublateral stripe on either side; scutal lobes a little darker than the remainder of the scutum; scutellum yellowish, a little darker medially at the base; postnotum reddish medially, more yellowish laterally. Pleura reddish-yellow, very sparsely pruinose, the propleura clearer yellow. Halteres yellow, the knobs brown. Legs with the coxae obscure yellow; trochanters yellow, remainder of the legs pale brownish-testaceous. Wings with a light yellowish suffusion, a little darker along the costal margin; stigma indistinct; veins brownish-yellow. Venation: Sc short,  $Sc^1$  ending immediately before the origin of Rs,  $Sc^2$  some distance from the tip of  $Sc^1$ , the latter alone being nearly as long as the basal deflection of  $Cu^1$ ; Rs short, strongly arcuated, a little longer than the slightly less arcuated basal deflection of  $R^{4+5}$ ; cell first  $M^2$  rectangular, m about one-half the outer deflection of  $M^3$ ; basal deflection of  $Cu^1$  at the fork of M. Abdominal tergites dark brown, the caudal margins of the segments

narrowly yellowish; dorsal shield of the ovipositor dark brown; sternites obscure yellow. Ovipositor with the valves very small, the tergal valves upcurved, acute at the tips.

*Hab.* Lord Howe Island (A. M. Lea). Type, I. 12137.

*D. brevirama* is nearly related to *D. auripennis* Skuse, differing in the colouration of the head, antennae, and abdomen.

### **DICRANOMYIA SUBREMOTA sp. nov.**

Antennae dark brown; general colouration grey; mesonotal praescutum and scutum marked with light brown; legs brownish-yellow, the tips of the tibiae narrowly dark brown; wings faintly greyish-yellow, sparsely spotted with brown; Se short, basal deflection of Cu<sup>1</sup> far before the fork of M.

♂ Length, about 5 mm.; wing, 6 mm. ♀ Length, 5.4 mm.; wing, 6.5–6.7 mm.

Rostrum and palpi dark brown. Antennae dark brown; flagellar segments suboval. Head grey. Mesonotum grey, with three broad but ill-defined light brown stripes; scutal lobes light brown, median area grey; remainder of mesonotum grey. Pleura dark, grey pruinose. Halteres light brown, yellow basally. Legs with the coxae dark brown; trochanters obscure brownish-yellow; femora brownish-yellow, the tips indistinctly darkened; tibiae and metatarsi obscure yellow, the tips narrowly but conspicuously dark brownish-black; terminal tarsal segments blackened. Wings with a faint greyish-yellow tinge, with very small and indistinct brown seams, arranged as follows: at arculus; at origin of Rs; the stigmal area, appearing as a narrow seam to r; narrow seams along the cord and outer end of cell first M<sup>2</sup>; veins pale yellowish-brown. Venation: Se short, Se<sup>1</sup> extending a short distance beyond the origin of Rs, Se<sup>2</sup> some distance from the tip of Se<sup>1</sup>, lying before the origin of Rs; Se<sup>1</sup> alone about equal to the basal deflection of Cu<sup>1</sup>; Rs long, gently arcuated, about twice the deflection of R<sup>1+5</sup>, the latter about equal to the first section of vein R<sup>2+3</sup>; r at about one-third R<sup>2+3</sup>; r-m faint; basal deflection of Cu<sup>1</sup> about its own length before the fork of M; Cu<sup>2</sup> longer than the basal deflection of Cu<sup>1</sup>. Abdominal segments dark brown; genital segments obscure yellow.

*Hab.* Norfolk Island (A. M. Lea). Type, I. 12138.

### **DICRANOMYIA IDONEA sp. nov.**

General colouration dull yellow; antennae moniliform; halteres with the apices tipped with yellow; legs short, hairy, yellow, the femora with two narrow brown subterminal rings; tibiae and first three tarsal segments tipped with black; wings pale yellow, sparsely spotted and clouded with brown and grey; Rs and

the basal deflection of  $R^{4+5}$  strongly arcuated at origin; inner end of cell first  $M^2$  strongly arcuated; abdominal tergites dull yellow, the basal half of each segment dark brown; base of the sternal valves of the ovipositor shiny black.

♀ Length, about 5.8–6.5 mm.; wing, 7–7.4 mm.

Rostrum and palpi dark brown, the former slightly elongate. Antennae dark brown; flagellar segments moniliform, each segment except the terminal ones being broader than long, subdisciform, closely appressed to one another. Head dark. Mesonotum dark brown (discoloured, in fresh specimens probably covered with a light pollen). Pleura dark brown, pruinose. Halteres pale, the base of the knobs brown, the apices yellowish. Legs with the coxae brownish-yellow; trochanters brownish-yellow; legs short, femora slightly incrassated at tips, hairy, reddish-orange in colour, the apical half more yellowish with two narrow subterminal brown rings; tibiae and basal three tarsal segments brownish-yellow, the tips conspicuously blackened; segments four and five entirely black. Wings with a yellowish tinge; restricted brown markings as follows: at arculus, origin of  $R_s$ , tip of  $Sc$ , along the cord and outer end of cell first  $M^2$  and at the tips of the longitudinal veins; paler grey clouds at the stigma; a large blotch about midway between arculus and the origin of  $R_s$ ; clouds near the outer ends of cells second  $R^1$ ,  $R^3$ ,  $R^5$ , second  $M^2$  and  $M^3$ ; outer ends of the posterior and anal cells indistinctly greyish; veins dark brown,  $C$ ,  $Sc$ , and  $R$  more brownish-yellow. Venation:  $Sc$  extending to about opposite midlength of  $R_s$ ,  $Sc^2$  some distance from the tip of  $Sc^1$ , the latter alone being longer than  $r$ ;  $R_s$  and the basal deflection of  $R^{4+5}$  strongly arcuated at origin, the latter about two-thirds the former; inner end of cell first  $M^2$  considerably arcuated,  $r-m$  being placed beyond midlength of cell first  $M^2$ ; this latter cell about as long as vein  $M^{1+2}$  beyond it; basal deflection of  $Cu^1$  before the fork of  $M$ , about opposite the fork of  $R_s$ ; cell second  $A$  broad. Abdominal tergites dull yellow, the basal half of each tergite dark brown; sternites yellowish; pleural membrane dull brown. Ovipositor with the sternal valves long, straight, powerful, the apices acute, the bases shiny black; tergal valves small, acute.

*Hab.* Tasmania: King Island (A. M. Lea). Type, I. 12139.

### **DICRANOMYIA SEDATA** sp. nov.

Head grey; mesonotum brown; pleura obscure yellow with a narrow brown longitudinal stripe; wings light grey with narrow seams and clouds along the cord, outer end of cell first  $M^2$  and origin of  $R_s$ ; vein  $Sc$  long, cell first  $M^2$  closed.

♂ Length, about 5.5 mm.; wing, 5.4 mm.

Rostrum light brown; palpi brown. Antennae dark brown (flagellum broken). Head grey. Mesonotum brown (injured by the pin). Pleura obscure

yellow with a conspicuous but narrow dark brown longitudinal stripe. Halteres light brown. Legs long and slender; coxae and trochanters brownish-yellow; femora brownish-testaceous, the tips narrowly darkened; remainder of the legs light brown. Wings light grey, cell Sc a little more brownish; stigma short-oval, dark brown; paler brown clouds at the origin of Rs; tip of Sc<sup>1</sup>; along the cord and outer end of cell first M<sup>2</sup>; veins brown. Venation: Sc long, Sc<sup>1</sup> ending about opposite three-fifths Rs, Sc<sup>2</sup> at the tip of Sc<sup>1</sup>; Rs long, strongly arcuated at origin; r at the tip of R<sup>1</sup>; cell first M<sup>2</sup> closed, pentagonal; m about one-half the outer deflection of M<sup>3</sup>; basal deflection of Cu<sup>1</sup> immediately before the fork of M; Cu<sup>2</sup> and the basal deflection of Cu<sup>1</sup> subequal. Abdomen dark brown, the bases of the tergites indistinctly pale; sternites with the apical half of each segment brown, the basal half yellowish. Male hypopygium comparatively large, complicated; pleurites large, subglobular, the inner face before the apex produced into a complex fleshy lobe; appendages very small and inconspicuous. Gonapophyses complicated, arranged in two pairs, the outer pair shorter, finely transversely wrinkled, terminating in a small conical tooth; inner apophyse longer, appearing as pale flattened blades, each with a small tooth on the outer margin beyond midlength.

*Hab.* Queensland: Cairns district (A. M. Lea). Type, I. 12140.

### **DICRANOMYIA NORFOLCENSIS** sp. nov.

♀ Length, 5.8 mm.; wing, 6.3 mm.

Related to *D. sedata*, sp. nov., differing as follows:

Femora with the tips narrowly pale, there being a subterminal brown ring of approximately equal extent. Wings more yellowish than grey; Sc much longer, extending to about opposite three-fourths the length of the longer Rs; basal deflection of R<sup>4+5</sup> longer, more than twice as long as r-m; cell first M<sup>2</sup> more regularly rectangular. Abdominal tergites dark brown, narrowly and indistinctly paler basally; sternites obscure brownish-yellow.

*Hab.* Norfolk Island (A. M. Lea). Type, I. 12141.

### **LIBNOTES** Westwood, 1876.

### **LIBNOTES TERRAE-REGINAE** sp. nov.

Head yellow, the vertex and occiput marked with dark brown; femora yellow with a broad dark brown subterminal ring; wings subhyaline, cells C and Sc yellowish; veins conspicuously seamed with brown; Rs long, strongly arcuated; vein second A short and strongly arcuated.

♂ Length, 7 mm.; wing, 9 mm.

Rostrum light brown; palpi dark brown. Antennae dark brown. Head yellow, the middle of the vertex and the occiput brown; vertex between the eyes very narrow. Pronotum grey, more infuscated medially. (Praescutum destroyed by the pin.) Scutellum and postnotum dark brown, sparsely greyish pruinose. Pleura reddish-yellow, with a large brown blotch on the mesepimeron and another on the lateral sclerites of the postnotum, the surface sparsely pruinose. Halteres obscure yellow, the knobs dark brown. Legs with the coxae infuscated; trochanters brownish-yellow; femora yellow with a broad dark brown subterminal ring, preceded and followed by a narrow, brighter yellow annulus; tibiae brownish-yellow, the tips narrowly infuscated, the base a little darkened; basal two tarsal segments brownish-yellow, the tips darkened; remainder of the tarsi dark brown. Wings subhyaline, cells C and Sc light yellow; stigma large but not solidly filled in, brown; conspicuous brown seams as follows: At Sc<sup>2</sup>; at the origin of Rs; along the cord and outer end of cell first M<sup>2</sup> and as conspicuous seams along veins R<sup>2+3</sup>, M<sup>1+2</sup>, M<sup>3</sup>, Cu<sup>1</sup>, Cu<sup>2</sup>, and the anal veins; anal angle of the wing narrowly darkened. Venation: Sc<sup>1</sup> ending a short distance beyond the fork of Rs; Rs long, strongly arcuated for a member of this genus; r a short distance from the tip of R<sup>1</sup>, which is bent strongly into the costa; inner ends of cells R<sup>3</sup>, R<sup>5</sup> and first M<sup>2</sup> about in alignment; r-m about equal to the deflection of R<sup>4+5</sup>; m about equal to the outer deflection of M<sup>3</sup>, but much more arcuated; vein second A short and strongly arcuated. Abdominal tergites dark brown, the hypopygium a little more reddish; sternites reddish-yellow with a faint greenish tinge, the segments broadly and conspicuously bordered laterally with black.

*Hab.* Queensland: Mount Tambourine (A. M. Lea). Type, I. 12142.

### **LIBNOTES OBLIQUA** sp. nov.

General colouration of the thorax obscure brownish-yellow; wings subhyaline, the stigma small and indistinct; Rs short and straight, in alignment with the deflection of R<sup>4+5</sup>; a supernumerary cross-vein in cell Sc<sup>1</sup> before r.

♀ Length, about 5.5 mm.; wing, 7.3 mm.

Rostrum and palpi dark brown. Antennae with the scapal segments light brown (flagellum broken). Head light grey. Pronotum obscure yellow, more brownish medially. Mesonotum obscure brownish-yellow, without distinct darker markings. Pleura obscure yellow. Halteres brownish-yellow (the knobs broken). Legs with the coxae obscure brownish-yellow, the outer faces slightly infuscated; trochanters obscure yellow; femora brownish-yellow (broken shortly beyond their bases). Wings subhyaline, the stigmal spot very small and indistinct; veins brown. Venation: Sc moderately long, ending opposite r-m, Sc<sup>2</sup> at the tip of Sc<sup>1</sup>; Rs very short and straight, about twice the deflection of R<sup>4+5</sup>;

these two veins being in oblique alignment;  $R^1$  projecting beyond  $r$ , the tip atrophied; a supernumerary cross-vein in cell  $Se^1$  about its own length before  $r$ ; veins beyond the cord long and parallel;  $m$  a little longer than the outer deflection of  $M^3$ , slightly arcuated; basal deflection of  $Cu^1$  beyond midlength of cell first  $M^2$ . Abdomen dark brown. Ovipositor with the valves small and slender, reddish horn-colour.

*Hab.* Queensland: Cairns district (A. M. Lea). Type I. 12143.

*L. obliqua* is closely allied to *L. nervosa* de Meijere, from which it differs in the different pattern of the wings and the venation, especially the longer  $Se$ ,  $Rs$ , and cell first  $M^2$ .

### **LIBNOTES HOWENSIS sp. nov.**

General colouration yellow, the mesonotum grey-pruinose; pleura striped longitudinally with dark brown lines; femora with a narrow dark brown subterminal ring; wings light yellow, very sparsely and indistinctly marked with brown.

♂ Length, about 15 mm.; wing, 17.2 mm. Middle leg, femur, 14.7 mm.; tibia, 13.5 mm.; tarsus, 11.5 mm.

Rostrum moderately elongate, yellow; palpi short, dark brown. Antennae with the elongate basal segment dusted with grey; second segment dark brown; flagellar segments yellow, the distal segments gradually infuscated; basal flagellar segments oval, the terminal segments more elongated. Head light cream colour. Vertex between eyes very narrow. Mesonotal praescutum light grey, very indistinctly marked with darker grey; scutum whitish grey, the centres of the lobes darker grey; remainder of the mesonotum whitish-pollinose. Pleura whitish-pollinose, narrowly lined with longitudinal dark brown stripes; the more dorsal of these lies behind the wing-root on the lateral sclerite of the postnotum; a second stripe begins above the fore coxa, traversing the mesepisternum and mesepimeron, becoming obsolete near the halteres. Halteres yellow, the knobs brown. Legs with the coxae yellow; a dark brown spot on the outer face of the fore coxa; femora yellow, the tips almost whitish; a narrow (about 0.9 mm.) subterminal brown ring; tibiae yellow, the tips narrowly darkened; basal two tarsal segments yellow, the tips narrowly darkened; terminal three tarsal segments black. Wings light yellow; stigma indistinct; very faint brown spots at the origin of  $Rs$ ; fork of  $M$ ; at the basal deflection of  $Cu^1$ ; at  $m$  and the tips of veins  $Cu^2$ , first  $A$  and second  $A$ , larger and more conspicuous on the latter; veins yellow, darker in the infuscated areas. Venation:  $Rs$  almost straight, in alignment with  $R^{4+5}$ ;  $r$  at the tip of  $R^1$ ; cell first  $M^2$  long and narrow;  $m$  nearly as long as  $Rs$ ; basal deflection of  $Cu^1$  at about one-fifth the length of the long cell



first  $M^2$ . Abdominal tergites dull yellow, the apical third of each tergite delicately and beautifully surface-reticulated.

*Hab.* Lord Howe Island (A. M. Lea). Type, I. 12144.

**ORIMARGULA Mik, 1883.**

**ORIMARGULA AUSTRALIENSIS sp. nov.**

General colouration light grey, the mesonotal praescutum with three confluent brownish stripes; halteres and legs brownish-yellow; wings whitish subhyaline, the stigma and cord narrowly and indistinctly infuscated.

♂ Length, about 3.8–4 mm.; wing, 5 mm. ♀ Length, 5.3 mm.; wing, 5.5 mm.

Rostrum reddish-brown, sparsely pruinose; palpi dark brown. Antennae of moderate length in both sexes, dark brown; flagellar segments oval. Head dark grey pruinose. Mesonotum light grey, the praescutum with the stripes rather indistinct, brown, entirely confluent; scutal lobes brown, the median area pruinose; scutellum pale, sparsely pruinose; postnotum brown, sparsely pruinose. Pleura light grey. Halteres brownish-yellow. Legs with the coxae yellow, very sparsely pruinose; trochanters brownish-yellow; femora and tibiae brownish-yellow, becoming darker towards the tips; tarsi light brown, the distal tarsal segments dark brown. Wings whitish-subhyaline; stigma brown; cord narrowly and indistinctly seamed with pale brown; in some specimens the wings are much more nearly unicolourous; cell  $Sc$  yellow; veins pale brown, veins  $Sc$  and  $R$  yellow. Venation:  $Rs$  long, straight, or weakly convex;  $r$  on  $R^{2+3}$  a little less than its own length beyond the fork of  $Rs$ ;  $Rs$  and the deflection of  $R^{4+5}$  subequal in length;  $r-m$  a little shorter than the deflection of  $M^{1+2}$ ; petiole of cell  $M^3$  short, about equal to  $r$ ; fusion of  $Cu^1$  and  $M$  about equal to  $M^3$  alone; basal deflection of  $Cu^1$  a short distance beyond the fork of  $Rs$  and nearly in alignment with  $r$ ; second anal vein short and straight. Anal angle of the wing prominent, as in the genus. Abdomen dark brown, sparsely pruinose.

*Hab.* Queensland: Cairns district (A. M. Lea). Type, I. 12145.

The genus is new to the Australasian region.

**ELEPHANTOMYIA Osten Sacken, 1859.**

**ELEPHANTOMYIA FUMICOSTA sp. nov..**

General colouration brownish-yellow; legs black, the tarsi largely white; wings greyish-brown, the costa and a conspicuous seam along the cord dark brown; abdominal segments two to seven yellow, ringed caudally with dark brown.

♂ Length (excluding rostrum), 9.5–10 mm.; wing, 7.8 mm.; rostrum, about 5.5 mm.

Rostrum dark brown. Antennae dark brown, the basal flagellar segment elongate-conical, the terminal segments elongate-cylindrical. Head brown, light yellow beneath. Mesonotal praescutum yellow or brownish-yellow without darker markings; remainder of the mesonotum slightly darker. Pleura yellow, the sternum a little darker. Halteres brown. Legs with the coxae and trochanters pale brown; femora and tibiae dark brownish-black; metatarsi black, the tips narrowly and abruptly white; segments two and three white, the terminal two segments infuscated; claws reddish. Wings with a greyish-brown tinge, the costal margin dark brown, this colouration continued around the wing-margin to the end of vein  $R^{4+5}$ ; cord and the origin of Rs broadly seamed with dark brown; cell  $R^1$  dark brown, with the exception of a large area of the pale ground-colour at the base; veins dark brown. Venation: Rs rather straight, angulated at origin;  $R^{2+3}$  almost perpendicular at origin, slightly spurred at the bend; basal deflection of  $R^{4+5}$  about equal to r-m; cell first  $M^2$  rather large; basal deflection of  $Cu^1$  about equal to m. Abdominal segment one obscure yellow; segments two to seven yellow, the caudal margin narrowly dark brown, these markings narrowest on the basal segments, broadest on the seventh segment, where it includes about the distal half; remainder of the abdomen dark brown.

*Hab.* North Queensland: Kuranda (F. P. Dodd), Babinda, August 7 1920 (J. F. Illingworth). Type, I. 12146, in South Australian Museum; paratype, alcoholic, in the collection of the author.

The genus *Elephantomyia* has not hitherto been recorded from Australia.

### **CERATOCHEILUS Wesché, 1910.**

Ten species of this well-defined genus have now been made known. It is of great interest to add still another form, the first from the Australian Region. It is possible that *Rhamphidia levis* Hutton, of New Zealand, is a member of this genus.

#### **CERATOCHEILUS AUSTRALASIAE sp. nov.**

Thorax brownish-yellow, the praescutum with three broad, nearly confluent, brown stripes; pleura brownish-yellow with a broad, dark brown longitudinal stripe; wings strongly infuscated, unspotted; cell first  $M^2$  closed.

♀ Length (excluding rostrum), 8 mm.; wing, 7.8 mm.; rostrum 5.5 mm.

Rostrum slender, dark brownish-black. Antennae dark brownish-black. Head yellowish-grey, the median area of the vertex a little infuscated; corniculus small, subcircular, yellowish-brown. Pronotum dark brown. Lateral margins of the mesonotal praescutum brownish-yellow, the disk with three broad dark brown stripes, the anterior ends of the lateral stripes confluent with the median stripe, restricting the ground-colour to two indistinct streaks near the suture;

scutal lobes dark brown; scutellum and postnotum reddish-testaceous, brown medially, sparsely pruinose. Pleura obscure brownish-yellow, with a broad dark brown longitudinal stripe extending from the pronotum to the base of the abdomen, passing through the base of the halteres. Mesosternum between the fore and middle coxae pale brown. Halteres pale brown, the knobs darker. Legs with the coxae and trochanters brown, the femora brown, paler basally; tibiae and tarsi darker brown; hairs on the legs profoundly bifid as in the genus. Wings with a strong brownish tinge, a little darker along the cord; cells C and Sc darker brown; veins dark brown. Venation:  $Sc^1$  ending a short distance beyond the origin of Rs,  $Sc^2$  opposite this origin; Rs short, straight, subequal to the deflection of  $R^{4+5}$ ;  $R^{2+3}$  sinuous, about twice the length of the sector; cell first  $M^2$  closed, in a little more than one-half the outer deflection of  $M^3$ ; basal deflection of  $Cu^1$  a short distance beyond the fork of M. Abdomen dark brown; valves of the ovipositor reddish horn-colour.

*Hab.* Lord Howe Island (A. M. Lea). Type, I. 12147.

### **MOLOPHILUS Curtis, 1833.**

#### **MOLOPHILUS GIGAS sp. nov.**

Antennae short in both sexes; size very large (wing of female 9 mm.); general colouration dark brown; femora yellow, the apical half brownish-black; wings amber-yellow.

♂ Length, about 6.5 mm.; wing, 8.7 mm. ♀ Length, about 8 mm.; wing, 9 mm.

Rostrum and palpi dark brown, the former dusted with grey. Antennae short in both sexes; scape dark brown; flagellar segments brown, the base of each segment obscure yellow to produce an indistinct bicolorous appearance; terminal flagellar segments uniformly dark brown. Head dark, conspicuously light grey-pruinose; vertex with conspicuous proclinate bristles. Pronotum brown. Mesonotal praescutum brown, grey-pruinose, with four darker brown stripes, the intermediate pair confluent anteriorly; region cephalad of the pseudosutural foveae rufous; tuberculate pits black, separated from one another by a distance about equal to the diameter of one; pseudosutural foveae conspicuous, black; remainder of the mesonotum dark brown. Pleura dark, sparsely light grey-pruinose; dorsal-pleural membranes obscure yellow; a patch of yellow hairs on the lateral sclerite of the postnotum. Halteres yellow. Legs with the coxae dark brown; trochanters yellow; femora with about the basal half yellow, the distal half conspicuously and abruptly dark brownish-black; the amount of yellow is greater on the fore and middle legs; tibiae and tarsi dark brownish-black; hind legs black, the femora incrassated. Wings with a strong amber-yellow tinge; veins

yellow, clothed with conspicuous brown hairs. Venation: Fusion of  $M^3$  and  $Cu^1$  about equal to the basal deflection of  $Cu^1$  alone. Abdomen dark brown, the caudal margin of the tergites narrowly and indistinctly paler; abdomen clothed with long, conspicuous yellow hairs. In the female the sternites are more yellowish. Ovipositor with the tergal valves slender, upcurved, horn-coloured; sternal valves acicular, almost straight, dark brown.

*Hab.* Tasmania: Waratah (A. M. Lea). Type, I. 12148.

This conspicuous species of *Molophilus* is by far the largest yet made known.

### **GNOPHOMYIA** Osten Sacken, 1859.

#### **GNOPHOMYIA CYANOCEPS** sp. nov.

Closely related to *G. fascipennis* (Thoms.); r lacking; cell first  $M^2$  open by the atrophy of  $M^3$ ; head above with a greenish-blue bloom.

♂ Length, 6 mm.; wing, 5.2 mm. ♀ Length, 6.3 mm.; wing, 6.2 mm.

Rostrum yellow, darker in the female; palpi dark brown. Antennal scape yellow, the apex of the second segment dark brown; flagellum dark brown. Front, genae, and anterior part of the vertex yellow; remainder of the vertex dark brown with a greenish-blue bloom. Pronotum and mesonotal praescutum reddish-yellow, unmarked with darker; scutal lobes dark brown; postnotum with two small blackish spots at the posterior margin. Pleura yellow; a reddish-brown area occupying portions of the mesosternum, mesepisternum, and mesepimeron. Halteres brown at the base, the remainder of the stem and part of the knob yellowish. Legs with the coxae and trochanters yellow; femora yellow, the tips narrowly infuscated, the surface with a few scattered erect bristles; tibiae light brown, the tips dark brown; tarsi brownish-black. Wings whitish-subhyaline, cells C and Sc yellow; in the female with three conspicuous bands and the apex brown; the first band occupies the region immediately beyond the areculus, incomplete; second band broad, extending from R to the wing-margin at the tip of the second anal vein; third band broad, complete, but more diffuse posteriorly, mostly located beyond the cord; wing-apex narrowly darkened; in the male the three basal bands are only barely indicated; wing-apex uncoloured; veins dark brown; costa provided with flattened scales. Venation: Sc long,  $Sc^1$  extending to about one-third the length of Rs;  $Sc^2$  invisible; Rs long, almost straight;  $R^{2+3}$  about one-half longer than the basal deflection of  $Cu^1$ ; r atrophied; cell first  $M^2$  open by the atrophy of the outer deflection of  $M^3$ ; basal deflection of  $Cu^1$  a short distance beyond the fork of M. Abdominal tergites reddish-yellow in the male, the sternites lighter yellow; in the female the abdomen is dark brownish-black.

*Hab.* Northern Territory: Melville Island (W. D. Dodd). Type, I. 12149.

*G. fascipennis* (Thoms.) is related to this handsome little fly, but is readily

told by the retention of both  $r$  and the outer deflection of vein  $M^3$ . Both species are notable by their marked sexual dimorphism.

**RHABDOMASTIX Skuse, 1889.**

**RHABDOMASTIX GENEROSA sp. nov.**

Size large (wing of female over 11 mm.); antennae brownish-yellow; general colouration light grey; wings faintly yellowish;  $Sc$  long, extending to almost opposite the fork of  $Rs$ ;  $R^{2+3}$  and  $Rs$  subequal in length;  $R^1$  and  $R^2$  closely approximated at wing-margin.

♀ Length, 9.5 mm.; wing, 11.3 mm.; antenna, about 6 mm.

Rostrum and palpi light brown. Antennae brownish-yellow, the flagellar segments a little darker; antennae if bent backward extending to about the base of the third abdominal segment. Head light grey. Mesonotum light grey, the lateral margins of the praescutum narrowly and indistinctly brownish; pleura whitish-grey. Halteres light yellow. Legs with the coxae and trochanters testaceous-yellow (remainder of the legs broken). Wings with a faint yellowish tinge; stigma barely indicated; veins yellowish-brown. Venation:  $Sc$  long,  $Sc^1$  ending a short distance before the forking of the long  $Rs$ ,  $Sc^1$  a little shorter than the basal deflection of  $Cu^1$ ;  $Rs$  long, gently arcuated at origin, about as long as  $R^{2+3}$ ;  $R^2$  a little more than one-half the length of the basal deflection of  $Cu^1$ ;  $R^1$  and  $R^2$  close together at the wing margin, the space on costa between them being about one-third  $r-m$ ; cell first  $M^2$  small, short-rectangular,  $m$  being about one-half the outer deflection of  $M^3$ ; basal deflection of  $Cu^1$  just beyond the fork of  $M$ ;  $Cu^2$  about twice the deflection of  $Cu^1$ ; vein second  $A$  moderately long. Abdominal tergites brown, indistinctly obscure yellow before their apices; sternites obscure brownish-yellow. Ovipositor with the tergal valves slender, the points slightly curved; sternal valves strongly compressed.

*Hab.* New South Wales: Dorrigo (W. Heron). Type, L. 12150.

**TRENTEPOHLIA Bigot, 1854.**

**TRENTEPOHLIA DODDI sp. nov.**

General colouration reddish-yellow; legs yellow; wings pale yellowish, the wing-apex very narrowly infuscated; costal and subcostal veins yellowish.

♂ Length, 5.7–5.8 mm.; wing, 6 mm. ♀ Length, 6.5–7.5 mm.; wing, 6.1 mm.

Rostrum brownish-yellow; labial palpi yellowish; maxillary palpi light brown. Antennae dark brown. Head dark grey. Mesonotal praescutum reddish-yellow, moderately shiny; scutum brown; postnotum obscure yellow, the posterior half infuscated. Pleura reddish-yellow, slightly pruinose. Halteres

yellow. Legs with the coxae and trochanters obscure yellow; remainder of the legs yellow. Wings pale yellowish, the wing-apex very narrowly infuscated, continued basad as short, narrow seams along veins  $R^3$  and  $R^{4+5}$ ; veins dark brown, C, Sc and R more yellowish. Venation:  $Sc^1$  and  $R^1$  far removed from one another at the wing-margin, the distance on costa between them being about equal to the basal deflection of  $Cu^1$ ; Rs straight, about equal to the deflection of  $R^{4+5}$ ; tip of  $R^1$  beyond r faint and without macrotrichiae; r oblique, at about three-fifths the length of  $R^{2+3}$ ;  $R^2$  oblique, about equal to  $R^{4+5}$  plus  $M^{1+2}$ ; petiole of cell  $R^5$  less than one-half of the cell; basal deflection of  $Cu^1$  about one-half its length before the fork of M; fusion of  $Cu^2$  and first A at the wing-margin punctiform. Abdomen light brown, segments seven to nine brownish-black in the male; ovipositor pale.

*Hab.* Northern Territory: Melville Island (W. D. Dodd). Type, I. 12151.

### AUSTROLIMNOBIA gen. nov.

Palpi short. Antennae with probably sixteen segments, the flagellar segments cylindrical, gradually decreasing in length from the basal to the apical, provided with conspicuous appressed hairs and a few short verticils. Pseudosutural foveae represented only by a small oval area; no apparent tuberculate pits. Legs long and stout; no tibial spurs; tarsal segments one to three each with a single small apical spur; claws relatively small, simple; empodium present. Wings with Sc long,  $Sc^1$  not close to  $R^1$  at wing-margin;  $Sc^2$  some distance from the tip of  $Sc^1$ ; Rs originating far basad, at one-fourth the length of the wing, the fork of Rs at midlength of the wing; Rs in alignment with  $R^{4+5}$ ;  $R^{2+3}$  in alignment with  $R^2$ ; r some distance from the tip of  $R^1$ ; cell first  $M^2$  very long; forks of the longitudinal veins deep; cell  $M^1$  lacking.

The type species of this genus is one of the largest and most striking Briopterine crane-flies that has yet been discovered, rivalling in size species of the genera *Gnophomyia*, *Lecteria*, and *Clydonodozus*. No close relative can be pointed out by the writer.

### AUSTROLIMNOBIA SPECTABILIS sp. nov.

Antennae yellow; mesonotum greenish-yellow, the lateral margins and the pleura blackish; legs yellow, the tips of the femora, tips and bases of the tibiae black; wings hyaline, the costal margin with three dark brown blotches, the third of which encloses a yellow stigmal area; wing-apex broadly dark brown; three pale brown blotches along the posterior margin of the wing.

*Sex?* Wing, 19.5 mm.; fore leg, femur, 12.4 mm.; middle leg, femur, 13.5 mm.; tibia, 15.8 mm.; tarsus, 10.3 mm.

Rostrum and palpi dark brown. Antennae with the scapal segments brown; flagellar segments yellow (only thirteen antennal segments remain, but the tip is evidently broken, and the full number is probably sixteen); there is no evidence of any fusion of segments at the base of the flagellum as in many Eriopterini. Head blackish (if any bloom is normally present it is destroyed in the unique type); vertex between the eyes narrow. Pronotum dark brown. Mesonotum shiny greenish-yellow, the lateral margins of the praescutum broadly blackened; scutellum and postnotum brighter, more yellowish. Pleura brownish-black. Mesosternum between the fore and middle coxae with a greenish cast. Halteres brownish-black. Legs with the coxae black; trochanters chestnut-brown; femora yellow, the tips broadly (2.2 mm.) and abruptly black; tibiae yellow, the bases and apices rather narrowly (1.5 mm.) and subequally blackened; metatarsi yellow, passing into light brown toward the tip; remainder of the tarsi brown, the terminal segment deepening into black. Wings hyaline, conspicuously variegated with dark brown, pale brown, and yellow; cell C dark brown, passing into yellow before its outer end; cell Sc alternately dark brown and yellow; a conspicuous oval yellow mark in the stigmal region, surrounded by a conspicuous semicircular dark brown mark that extends from the outer end of cell Sc across the fork of  $R^{2+3}$  and thence to the tip of  $R^1$  and  $r$ ; two conspicuous dark brown circular areas, one at the origin of  $R_s$ , the second at the fork of  $R_s$ , sending a delicate seam along the cord to the fork of  $Cu$ ; wing-apex broadly dark brown, this including the ends of cells second  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^5$ , and second  $M^2$ ; along the posterior margin are three paler brown areas, extending from cell  $Cu^1$  to cell second A, largest at the ends of veins  $Cu^2$ , second A, and before the end of vein first A, the latter narrowly connected with the brown seam at the cord; outer end of cell first  $M^2$  very narrowly and indistinctly infuscated; veins yellow, darker in the infuscated areas. Venation:  $Sc^1$  ending opposite the fork of  $R^{2+3}$ ,  $Sc^1$  alone being about equal to the basal deflection of  $Cu^1$ ;  $R^1$  beyond  $r$  longer than the basal deflection of  $Cu^1$ ;  $R_s$  about equal to  $R^{2+3}$ ; basal deflection of  $R^{4+5}$  about equal to the first section of  $R^2$ ; cell first  $M^2$  long and narrow, about as long as vein  $M^3$  beyond it; inner ends of cells  $R^5$ , first  $M^2$ , and  $Cu^1$  in direct alignment;  $m$  equal to the outer deflection of  $M^3$ ; basal deflection of  $Cu^1$  near the fork of  $M$ . (Abdomen broken.)

*Hab.* Tasmania: Waratah (A. M. Lea). Type, I. 12152.

### **EPIPHRAGMA** Osten Sacken, 1859.

The genus *Epiphragma* had not been previously recorded from the Australasian Region,

**EPIPHRAGMA TERRAE-REGINAE sp. nov.**

Antennae dark brown, the first flagellar segment orange; mesonotal praescutum with the anterior half dark brown, the posterior half abruptly light yellow; legs yellow, the femora with two brown rings; tibiae with a narrow brown ring beyond the base; wings brown, the margin with darker brown areas that are narrowly bordered with light yellow.

♀ Length, 10 mm.; wing, 10.5 mm.

Rostrum brown, dusted with golden pollen; palpi dark brown. Antennae dark brown, the first flagellar segment orange; second flagellar segment pale brown; remainder of the flagellum dark brown. Head dark, dusted with brown. Pronotum extensive, fulvous brown. Mesonotal praescutum with the anterior half dark brown, beyond midlength conspicuously and abruptly covered with a light yellow pollen (scutum injured in pinning); scutellum brown, paler caudally; postnotum brown, the posterior third yellowish with a capillary dark brown median line. Pleura brown with a slightly darker ventral stripe. Halteres yellowish-brown, the knobs darker. Legs with the posterior and middle coxae conspicuously light yellow, the extreme bases dark brown; anterior coxae dark brown except at the apex; trochanters light yellow; femora yellow, before the tips with a broad (1.4 mm.) dark brown ring; a narrower post-medial brown annulus; tibiae yellow with a narrow brown ring shortly beyond the base, tips narrowly darkened; tarsi brownish-yellow, the tips darkened. Wings brown; quadrate to subcircular darker brown areas, arranged as follows: at h; bases of cells R and M; at origin of Rs; at the supernumerary cross-vein in cell C; an area at the end of Sc, continued caudad along the cord; tip of R<sup>1</sup> and r; tips of R<sup>2</sup> and R<sup>3</sup>; these markings are conspicuously margined with yellow; slightly paler brown markings at the ends of the longitudinal veins; outer end of cell first M<sup>2</sup> and the fork of M<sup>1+2</sup> clouded; veins dark brown. Venation: R<sup>2+3</sup> about equal to the basal deflection of Cu<sup>1</sup>; r about its own length from the tip of R<sup>1</sup>; petiole of cell M<sup>1</sup> about equal to the basal deflection of Cu<sup>1</sup>; basal deflection of Cu<sup>1</sup> near two-fifths the length of cell first M<sup>2</sup>. Abdominal tergites brown, still darker brown laterally; sternites yellowish-brown, the basal sternites brighter apically.

*Hab.* Queensland: Cairns district (A. M. Lea). Type, 1. 12153.

**EPIPHRAGMA HOWENSIS sp. nov.**

♂ Length, about 11.5 mm.; wing, 12 mm.; antenna, about 4.5 mm.

Generally similar to *E. terrae-reginae*, differing as follows: Antennae of the male elongate, if bent backward extending to considerably beyond the base of the abdomen; flagellar segments one to three orange-yellow; segments four to



eight yellow, the bases narrowly infuscated; remainder of the flagellum dark brown. Head with a blackish dash on either side of the vertex, adjoining the inner margin of the eye. Mesonotal praescutum with the yellow posterior half quadrilinate with dark brown; scutal lobes dark brown; scutellum light brownish-yellow with a narrow brown median line; postnotum indistinctly trilineate with brown. Pleura dark brown. Legs long and slender, yellow, unmarked with darker. Wings with the pattern nearly as in *E. terrae-reginae*, but the darker circles at the basal deflection of  $Cu^1$ , outer end of cell first  $M^2$ , and the fork of  $M^{1+2}$  deeper coloured, conspicuously margined with pale conspicuous yellow spots in the outer ends of cells  $R^2$  to first A. Venation:  $R^{2+3}$  a little longer than the basal deflection of  $Cu^1$ ; petiole of cell  $M^1$  long, approximately twice as long as the basal deflection of  $Cu^1$ . Abdomen dark brown.

*Hab.* Lord Howe Island (A. M. Lea). Type, I. 12154.

### LIMNOPHILA Macquart, 1834.

#### LIMNOPHILA PILOSIPENNIS sp. nov.

Mesonotum shiny reddish-yellow; praescutum with a narrow darker brown median stripe; pleura brownish-yellow with a conspicuous blackish area on the mesepimeron; wings yellowish-grey, the apices of the radial cells with macrotrichiaë; abdomen dark brown, the basal sternites more yellowish.

♀ Length, 6.5 mm.; wing, 7.5 mm.

Rostrum greyish-pubescent; palpi dark brown. Antennae with the scapal segments dark brown; flagellar segments light brown, the outer ones becoming darker; flagellar segments oval, becoming more elongate toward the end of the organ. Head dark brown with a sparse pollen. Pronotum dark brown. Mesonotum shiny reddish-yellow, the praescutum with a narrow, darker brown median stripe. Pleura brownish-yellow; a conspicuous blackish area on the mesepimeron; mesosternum infuscated. Halteres pale brown, the apices of the knobs light yellow. Legs with the coxae yellowish-brown; trochanters dull yellow; femora brownish-yellow with an indistinct brownish ring at about one-third the length; remaining segments of the leg brownish-yellow, the tips of each very narrowly infuscated. Wings with a yellowish-grey tinge, the costal and subcostal cells and the stigma light yellow; veins light greyish-yellow. Venation: Sc long,  $Sc^1$  ending about opposite the fork of Rs;  $Sc^2$  a short distance from the tip of  $Sc^1$ , the latter alone about equal to the basal deflection of  $Cu^1$ ; Rs long, arcuated at origin, in direct alignment with  $R^{2+3}$ ; r indistinct;  $R^{2+3}$  about one-half longer than r-m; inner end of cells  $R^3$ ,  $R^5$ , and first  $M^2$  in direct alignment; cell first  $M^2$  small, long-pentagonal; cell  $M^1$  short, its petiole about as long as Rs; basal deflection of  $Cu^1$  just before midlength of cell first  $M^2$ . A sparse grouping of

strong macrotrichiae in the ends of cells  $R^1$  to  $M^1$ . Abdomen dark brown, the basal sternites more yellowish. Valves of the ovipositor long, horn-coloured.

*Hab.* Lord Howe Island (A. M. Lea). Type, I. 12155.

### **LIMNOPHILA LEAI sp. nov.**

General colour dark, sparsely dusted with grey; halteres yellow; legs short and hairy; wings yellowish-subhyaline, brighter at the base, variegated with brown; wing-tip broadly infuscated; cell  $M^1$  lacking.

♀ Length, 9.5-10 mm.; wing, 7.8-8.2 mm. Middle leg, femur, 3.6 mm.; tibia, 3.4 mm.

Rostrum and palpi dark brown. Antennae black, with sixteen segments, the basal flagellar segments pyriform, the fourth and fifth very slightly produced on their inner face, but with no indication of a pectination. Head black, sparsely brownish-grey pruinose, especially on the front and anterior portion of the vertex. Pronotum light grey-pruinose. Mesonotal praesutum dark brown, the humeral region more castaneous; remainder of the mesonotum brighter brown, especially the scutellum. Pleura heavily light grey-pruinose. Halteres yellow. Legs with the coxae light grey-pruinose; trochanters obscure yellow; legs short and conspicuously hairy; femora yellow, the slightly incrassated apical third black; tibiae yellowish-brown, the tips dark brown; tarsi black, the bases of the metatarsi a little brighter; tarsi a little longer than the tibiae; tibial spurs long. Wings yellowish-subhyaline, the base brighter; cells C and Sc brownish-yellow; three incomplete cross-bands and the wing-tip brown; the basal band occupies the bases of cells R and M, connected in cell Cu with the second band, which occupies the level of the origin of Rs, appearing as a large blotch at its origin; a large area in cells M and Cu and a small blotch near the end of cell first A; the third band occupies the level of the cord, extending from the stigma to the posterior margin, at cell first  $M^2$  split to include both ends of the cell; wing-apex in cells  $R^2$ ,  $R^3$ ,  $R^5$ , second  $M^2$  and  $M^3$  broadly brown; veins yellow, brown in the infuscated areas. Venation: Rs angulated at origin,  $R^{2+3}$  a little longer than the basal deflection of  $R^{4+5}$ ; r a little more than its own length from the tip of  $R^1$ ; r-m shorter than m; cell first  $M^2$  small, subhexagonal; cell  $M^1$  lacking; basal deflection of  $Cu^1$  beyond midlength of cell first  $M^2$ ; vein second A sinuous, the cell broad.

*Hab.* Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12156.

*L. leai* and the following species, *L. carteri*, bear a striking resemblance to species of *Gynoplistia*, and yet by the antennal structure must be referred to *Limnophila*. The discovery of the male sex should be of interest,

**LIMNOPHILA CARTERI** sp. nov.

General colouration dark brown; halteres with the knobs dark brown; wings faintly yellowish, conspicuously spotted and clouded with dark brown; base of cell R unmarked with brown; cell  $M^1$  present.

♀ Length, 9.5 mm.; wing, 9.5 mm. Fore leg, femur, 6 mm.; tibia, 5.8 mm.

Generally similar to *L. leai*, differing as follows:

Halteres with the knobs dark brown. Legs longer and more slender, less hairy; femora dark brown, the basal quarter obscure yellow; tibiae and metatarsi yellowish-brown, the tips dark brown; remainder of the tarsi dark brown. Wings faintly yellowish, cells C and Sc more saturated; membrane heavily spotted and clouded with brown, arranged as follows: a small spot at about one-third the length of cell R; a large circular spot at the origin of Rs; a broad seam along the cord; conspicuous spots at the end of vein  $R^2$ , at the outer end of cell first  $M^2$ , and at the fork of  $M^{1+2}$ ; conspicuous brown washes occupying most of cell M, except the base and outer end; a broad seam along vein M to the cord; wing-apex in cells  $R^2$ ,  $R^3$ ,  $R^5$  and  $M^1$  narrowly and unevenly darkened; slightly more than the basal half of cell Cu darkened, this colour also including the ends of the anal cells; veins brown. Venation:  $R^{2+3}$  about equal to the basal deflection of  $R^{4+5}$ ; cell  $R^2$  widely flaring at outer margin; cell first  $M^2$  long-hexagonal, the basal deflection of Cu before midlength; cell  $M^1$  present, nearly one-half longer than its petiole. Abdomen dark brown, the sternites more reddish. Ovipositor with the valves long and slender, horn-coloured.

*Hab.* Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12157.

The type is badly discoloured and there is a possibility that the head and thorax are not grey pruinose in fresh specimens, as in *L. leai*.

**LIMNOPHILA EFFETA** sp. nov.

Size small (wing of ♀ under 6 mm.); general colouration dark; halteres yellow; legs yellow, the femora with a narrow subterminal brown ring, tips of the tibiae and metatarsi narrowly blackened; wings yellowish-subhyaline, the stigma and anal angle faintly darkened; cell  $M^1$  present.

♀ Length, 5.5 mm.; wing, 5.8 mm.

Rostrum and palpi dark brown. Antennal scape reddish-brown (the flagellum broken). Head dark coloured (discoloured). Mesonotum dark coloured (badly greased in the unique type); median area of the scutum more reddish. Pleura dark, grey pruinose. Halteres light yellow. Legs with the coxae obscure yellow, the fore coxae infuscated; trochanters obscure yellow; femora brownish-yellow with a narrow subterminal brown ring; tibiae and metatarsi yellow, the

tips narrowly but conspicuously blackened; remainder of the tarsi brownish-black. Wings yellowish-subhyaline, cells C and Sc slightly more yellowish; stigma slightly darker brown, ill-defined; anal angle of the wing infuscated; veins dark brown. Venation: Sc ending about opposite the fork of Rs, Sc<sup>2</sup> a slight distance from the tip of Sc<sup>1</sup>, Sc<sup>1</sup> alone being a little longer than the basal deflection of Cu<sup>1</sup>; Rs long, subangulated at origin, in alignment with R<sup>2+3</sup>; R<sup>2+3</sup> a little more than one-half R<sup>2</sup>; r rather faint, at or immediately beyond, the fork of R<sup>2+3</sup> and on R<sup>1</sup> nearly twice its own length from the tip; inner ends of cells R<sup>3</sup>, R<sup>5</sup> and first M<sup>2</sup> in oblique alignment, but R<sup>3</sup> shorter than R<sup>5</sup>; cell first M<sup>2</sup> long and narrow, widened distally; petiole of cell M<sup>1</sup> long, about twice the cell and approximately as long as cell first M<sup>2</sup>; basal deflection of Cu<sup>1</sup> at or just beyond midlength of the latter. Abdomen dark brown. Ovipositor with the valves elongate, slender, strongly upcurved, reddish-horn-coloured.

*Hab.* Tasmania: Wilmot (H. J. Carter and A. M. Lea). Type, I. 12158.

*L. effeta* is apparently closely related to *L. disposita* Skuse (New South Wales), differing in the smaller size and in the venational details, as the length of Rs and the position of the radial cross-vein.

### **LIMNOPHILA PANTHERINA sp. nov.**

Antennae of the male elongate; general colouration light brown, the thoracic pleura grey-pruinose; legs yellow; wings subhyaline, the costal margin yellowish, the cells spotted and dotted with brown; R<sup>2+3</sup> short, r far from the tip of R<sup>1</sup>.

♂ Length, 10.5 mm.; wing, 10.8 mm.; antenna, about 4 mm.

Rostrum brownish-yellow; palpi brown. Antennae of the male elongate, if bent backward extending to opposite midlength of the second abdominal segment; antennae brownish-yellow. Head brown. Mesonotum brown, grey-pruinose (discoloured in the type), the postnotum more testaceous. Pleura light grey-pruinose, darker on the lateral sclerites of the postnotum and on the sternum. Halteres long and slender, light brown. Legs with the coxae yellowish-testaceous; trochanters yellow; femora and tibiae obscure yellow (tarsi broken). Wings subhyaline, the costal margin light yellow, this colour extending to the wing-apex; stigmal spot small, dark brown; dark brown spots arranged as follows: at areolus; origin and fork of Rs; tip of Sc; at r; tip of R<sup>1</sup>; R<sup>2</sup>; a smaller spot at R<sup>3</sup>; an interrupted seam along the cord; sparse small brown dots in all the cells of the wings excepting Sc, there being about twenty-five in cell C; veins dark brown, C, Sc, and R yellowish-brown. Venation: Sc long, extending beyond the fork of R<sup>2+3</sup>, Sc<sup>2</sup> longer than Sc<sup>1</sup> and near its extreme tip; Rs long, almost straight; R<sup>2+3</sup> short, about two-thirds the basal deflection of Cu<sup>1</sup>; r very far before the tip of R<sup>1</sup>, the ultimate section of R<sup>1</sup> being longer than the penultimate; r near one-

third the length of cell  $R^2$ ; petiole of cell  $M^1$  about equal to  $R^{2+3}$ ; basal deflection of  $Cu^1$  near midlength of cell first  $M^2$ , the latter slightly widened distally. Abdomen elongate, the tergites with about the basal three-fifths of each segment yellow, the apex darkened; a more or less distinct basal brown band and two impressed transverse marks near two-fifths the length of each tergite; sternites obscure yellow. Hypopygium blackened.

*Hab.* Victoria: Black Spur, Dividing Range, May 16, 1901 (W. Ashby).  
Type, I. 12159.

**LIMNOPHILA (PSEUDOLIMNOPHILA) INDECORA sp. nov.**

General colouration clear light grey; a narrow dark brown line from the pronotum to the base of the abdomen; praescutum with three brown stripes; femora and tibiae blackened at tips; wings yellowish-subhyaline, sparsely variegated with brown, the outer half of cell  $R^5$  infuscated; Rs long, angulated at origin;  $R^{2+3}$  short; basal deflection of  $Cu^1$  near the fork of M.

♀ Length, about 11.5-12.5 mm.; wing, 11.4-12.3 mm.

Rostrum dark coloured, sparsely pruinose; palpi dark brown. Antennae with the basal segment dark, greyish-pruinose; second segment reddish, slightly pruinose; flagellum dark brown. Head light grey, the middle of the vertex a little darker. Pronotum light grey, more infuscated medially. Mesonotal praescutum clear light grey with three brownish stripes, the median stripe obliterated anteriorly excepting a narrow darker median stripe that continues to the anterior margin; lateral stripes shorter; pseudosutural foveae black, very conspicuous, their surface granular; remainder of the mesonotum clear grey, the scutum and scutellum narrowly darker medially. Pleura clear grey. Halteres brown, the base of the stem yellow. Legs with the coxae light grey pruinose; trochanters reddish-yellow; femora brownish-yellow, the tips broadly blackened; tibiae yellow, the tips narrowly blackened; basal three tarsal segments brownish-yellow, the tips narrowly darkened; terminal tarsal segments dark brown. Wings yellowish-subhyaline, the costal and subcostal cells more brownish-yellow; stigma oval, dark brown; small brown spots as follows: at origin and fork of Rs; at  $Sc^2$ ; tip of  $R^2$ ; fork of  $Cu$ ; at r-m, and at fork of  $M^{1+2}$ ; apical half of cell  $R^5$  and the tip of  $R^2$  strongly infuscated. Venation: Sc ending a little beyond the fork of Rs,  $Sc^2$  slightly removed from the tip,  $Sc^1$  alone about equal to  $R^{2+3}$ ; Rs long, angulated at origin;  $R^{2+3}$  shorter than the deflection of  $R^{4+5}$ ; r far from the tip of  $R^1$ , the latter tip alone longer than the basal deflection of  $Cu^1$ ; r on  $R^2$  a little more than its own length beyond the fork of  $R^{2+3}$ ;  $R^2$  sinuous; r-m very reduced in size; cell first  $M^2$  hexagonally rectangular; petiole of cell  $M^1$  about equal to or shorter than cell first  $M^2$  and shorter than vein  $M^2$ ; basal deflection of  $Cu^1$

immediately beyond the fork of M; vein second A long, sinuous. Abdomen dark brown, sparsely pruinose; sternites more yellowish, especially on the lateral and apical margins of each segment, sparsely pruinose; faint linear lateral dashes. Ovipositor with the valves long and slender, yellowish horn-colour.

*Hab.* Western Australia: Warren River (W. D. Dodd). Tasmania: King Island (A. M. Lea). Type, l. 12160.

### **XENOLIMNOPHILA** subgen. nov.

Antennae with seventeen segments in both sexes. Wings reduced to linear pads in both sexes. Legs very long and slender, the tibiae with long spurs.

This peculiar fly is well worthy of subgeneric rank. The genus *Zaluscodes* Lamb<sup>(1)</sup> is based on *Z. aucklandicus* Lamb, a small, brownish-yellow fly from the Auckland Islands. This group and *Alfredia* Bezzi<sup>(2)</sup> are apparently degenerate species of *Limnophila*, since they possess sixteen-segmented antennae and other *Limnophilinae* characteristics. Apparently these species, together with *L. uspidoptera* Coq. and *L. subaptera* Alex., of Western North America, have no more claim to generic rank than have the numerous subapterous species of *Tipula* and related genera. *Xenolimnophila*, however, has seventeen-segmented antennae of a rather peculiar structure, and the affinities of the group may be closer to *Gynoplistia*, in spite of the almost simple structure of the antennal flagellum.

### **LIMNOPHILA (XENOLIMNOPHILA) ZALUSCODES** sp. nov.

Subapterous in both sexes; legs long and slender, longer in the male than in the female.

♂ Length, about 13.5 mm.; wing, 2 mm. Fore leg, femur, 13.5 mm.; tibia, 18 mm.; hind leg, femur, 13.8 mm.; tibia, 19.6 mm. ♀ Length, about 15.5–16 mm.; wing, 2 mm. Fore leg, femur, 7.9 mm.; tibia, 9.3 mm.; hind leg, femur, 8.1 mm.; tibia, 11.4 mm.

Rostrum and palpi dark brown. Antennae seventeen-segmented, moderately elongate, dark brown, the scapal segments more reddish; flagellar segments subcylindrical, the inner face a little produced. Head reddish-brown, narrowed behind. Mesonotum reddish-brown, the praescutum with two narrow darker lines; pleura sparsely pruinose. Thorax small, the dorsum flattened as in most subapterous *Tipulidae*. Halteres yellow, the knobs dark brown. Legs of the male much longer than in the female, as shown by the above measurements, giving the insect a spider-like appearance; coxae long and prominent, heavily

(1) Lamb, Subantarctic Islands of New Zealand, 1, 1909, p. 130.

(2) Bezzi, Atti Soc. Ital. Sci. Nat., lvii, 1918, p. 20-22.

dusted with grey; tibiae very long, longer than the femora; tibial spurs long and slender. Wings yellow, reduced to mere strap-like lobes with no distinct venation, a little longer than the halteres. Abdomen dark brown, lighter coloured in the female. Male hypopygium with the pleurites short and stout; pleural appendages two, relatively small and slender. Ovipositor with the valves long and powerful, blackened at the base, the apical half of the valves paler.

*Hab.* Tasmania: Waratah (H. J. Carter and A. M. Lea). Type, I. 12161.

### **CEROZODIA Westwood, 1835.**

#### **CEROZODIA FLAVIPES sp. nov.**

Size large (wing of female over 20 mm.); tarsi light yellow; mesonotum brownish-grey in the male with three dark brown stripes; in the female more reddish-brown with the stripes less distinct.

♂ Length, about 17 mm.; wing, 16.2 mm.; antenna, about 10 mm.

♀ Length, 25-26 mm.; wing, 21.5 mm.; antenna, about 7 mm.

♂ Rostrum reddish-brown; palpi dark brown, Antennae with 25 segments; flagellar segments 1 to 21 with very long flabellations, the terminal two segments simple; the branches at about midlength of the organ are longest (about 2.6 mm.), shorter on the basal and terminal pectinated segments; scape light brown, the flagellum and branches dark brown. Head dark brownish-grey. Mesonotum brownish-grey with three dark brown stripes, the median stripe entire; remainder of the mesonotum dark brown, the scutellum a little more reddish. Pleura dark, heavily grey-pruinose; dorso-pleural membranes obscure yellow. Halteres light yellow, the knobs dark brown. Legs with the coxae dark, grey-pruinose; trochanters brownish-yellow; femora brown, the base paler, the tip narrowly yellowish, preceded by an indistinct darker ring; tibiae light brown, the tips narrowly darkened; metatarsi except the tip and the terminal tarsal segment brown; remainder of the tarsi light yellow. Wings whitish-subhyaline, the wing-base and cells C and Sc more yellowish; a heavy dark brown pattern as follows: a more or less distinct area at the base of cell R; a large spot at one-third the length of cell R; at origin of Rs; at the stigma, continued obliquely backward along the cord to the fork of M; a rounded spot at the tip of R<sup>2</sup>; less distinct clouds along the cord; outer end of cell first M<sup>2</sup>; fork of M<sup>1+2</sup>; along veins M and R<sup>4+5</sup>; brownish washes in cells M, Cu<sup>1</sup>, the distal half of R<sup>5</sup>, and near the ends of the anal cells. Venation: Sc long, Sc<sup>1</sup> extending to slightly beyond the fork of R<sup>2+3</sup>; r near mid-distance between the fork of R<sup>2+3</sup> and the tip of R<sup>1</sup>; R<sup>2+3</sup> a little shorter than the arcuated deflection of R<sup>4+5</sup>; petiole of cell M<sup>1</sup> shorter than cell first M<sup>2</sup>; basal deflection of Cu<sup>1</sup> at about two-fifths the length of cell first M<sup>2</sup>. Abdomen reddish-brown, sparsely pruinose, the caudal

margins of the basal segments and the entire distal tergites darker brown; sternites reddish-brown, sparsely pruinose.

♀ The females referred to this species agree in the general features of size and colour. The number of antennal segments is twenty in one specimen, twenty-one in the other; of these, only the basal five flagellar segments bear a short, subterminal serration. The mesonotum is more reddish-brown, with the praescutal stripes ill-defined. Legs darker, the pale femoral tips less clearly indicated. Wings with the brown spots more clearly defined; the brown washes in the medial and anal cells more restricted. Ovipositor with the valves slender, dark brownish-black. In the paratype female, the median praescutal stripe is reddish, split by a capillary dark brown line; legs indistinctly reddish. It is possible that more than a single species is involved in this group.

*Hab.* Tasmania: Hobart and Waratah (A. M. Lea); Cradle Mountain (H. J. Carter and A. M. Lea). Type, 1. 12162.

### **CEROZODIA MINUSCULA** sp. nov.

Size small (wing of female under 15 mm.); general colouration light grey, the praescutum with conspicuous black stripes; wings whitish-subhyaline, conspicuously spotted with brown.

♂ Length, 10.5 mm.; wing, 11.3 mm. ♀ Length, 12.5 mm.; wing, 12.4 mm.

Rostrum light grey pruinose; palpi dark brown. Antennae dark, the first segment greyish-pruinose; first flagellar segment of the male with a long, black flabellation (remainder of the antenna broken); in the female there are only fifteen antennal segments, the basal five segments with a moderately long branch on the inner face before the apex; terminal flagellar segments cylindrical. Head grey. Pronotum grey. Mesonotal praescutum light grey with three black stripes, the broad median stripe conspicuously split by a capillary grey line; pseudosutural foveae conspicuous, subrectangular in outline; scutum grey, each lobe with the centre blackened; scutellum grey; postnotum greyish, darker posteriorly. Pleura light grey; a slightly darker dorsal longitudinal stripe; mesosternum slaty-grey. Halteres yellow, the knobs dark brown. Legs with the coxae yellowish, grey pruinose, heaviest on the posterior coxae; trochanters obscure yellow; femora yellow, the tips broadly blackened; tibiae yellowish-brown, the tips broadly dark brown; metatarsi brownish-yellow (remainder of the tarsi broken). Wings whitish-subhyaline, the costal and subcostal cells solidly infuscated, cell Sc<sup>1</sup> largely pale; stigma oval, dark brown; conspicuous brown clouds as follows: at one-third the length of cell R; at origin of Rs; at the tip of R<sup>2</sup> and a seam along the cord; paler brownish-grey seams along most of the longi-



tudinal veins, at the outer end of cell first  $M^2$ ; at the fork of  $M^{1+2}$ , and at the end of cells  $Cu^1$ , first A, second A, and in the wing-axil; extreme base of the wing yellow. Venation: Rs angulated or slightly spurred at origin;  $R^{2+3}$  about equal to the deflection of  $R^{4+5}$ ; r on  $R^2$  a little more than its own length beyond the fork of  $R^{2+3}$ ; petiole of cell  $M^1$  equal to or slightly longer than cell first  $M^2$ ; basal deflection of  $Cu^1$  before midlength of cell first  $M^2$ . Abdomen dark brown, the basal sternites more yellowish, sparsely grey pruinose. Ovipositor with the tergal valves long and slender, only slightly upcurved.

*Hab* Tasmania: Wilnot (H. J. Carter and A. M. Lea). Type, I. 12163.

### **GYNOPLISTIA Westwood, 1835.**

#### **GYNOPLISTIA BELLA PALLIDAPICALIS subsp. nov.**

♂ Length, 9-10 mm.; wing, 9 mm.

Very similar to typical *G. bella* Walker, differing as follows:

Male antenna with twenty segments, the terminal five simple. Wings with the apical dark band reduced to an indistinct cloud in the ends of cells  $R^2$  to  $R^5$ ; the white spot in cell R is very small, much smaller than the white blotch beyond the origin of Rs.

This is the variety *B* mentioned by Skuse, his material having also been secured in Tasmania.

*Hab.* Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea).

### **STIBADOCERELLA Brunetti, 1918.**

The genus *Stibadocerella* was erected by Brunetti for the Oriental *S. pristina* Brunetti. It is of great interest to record a second species, the first member of the Cylindrotominae to be found in the Australasian Region. Although the type is in a highly fragmentary condition, there will be no doubt of the identity because of the conspicuous diagnostic characters listed under the species. The present form deviates from the original characterization of the genus by the long vein  $R^{2+3}$ , r-m being placed at the fork of the sector. The chief character still available for the separation of *Stibadocerella* from *Stibadocera* Enderlein would thus seem to be the impunctate head and thorax. The white tarsi are likewise a conspicuous character, though shared by the Oriental genus *Agastomyia* de Meijere (1919). This latter genus differs from all other known Tipulidae, with the exception of the Limnobiine *Doaneomyia* Alexander, in the possession of a single anal vein.

#### **STIBADOCERELLA TASMANIENSIS sp. nov.**

General colouration yellowish; mesonotal praesentum reddish-brown, impunctate; a conspicuous transverse brown stripe on the mesopleura; legs brown,

the tarsi largely white; wings with a strong brownish tinge; a few macrotrichiae in the cells near the wing-tip; r-m at the fork of Rs,  $R^{2+3}$  long and sinuous.

♂ Wing, 8.2 mm.; antenna, about 10.5 mm.

Rostrum and palpi brownish-yellow. Male antennae very long; scape obscure yellow; flagellar segments brown, each provided with abundant long erect hairs. Front obscure yellow; vertex broad, dark brown. Pronotum light yellow. Mesonotal praescutum reddish-brown, impunctate; remainder of the mesonotum reddish-testaceous. Pleura obscure yellow with a broad transverse dark brown mark across the mesopleura, extending from the lateral margins of the praescutum to the mesosternum between the fore and middle coxae. Halteres brown (the knobs broken). Legs with the coxae and trochanters obscure yellow; femora brown, the bases paler; tibiae and metatarsi dark brown; tarsal segments three and four, and the apex of two, white; last tarsal segment slightly infuscated. Wings with a strong brownish tinge; no stigma; veins dark brown; a few macrotrichiae in the apices of cells  $R^5$ , second  $M^2$ , and  $M^3$ . Venation: Sc long, ending about opposite two-fifths the long Rs,  $Sc^2$  at the tip of  $Sc^1$ ; Rs long, the basal third subsinuous; r-m at the end of Rs,  $R^{2+3}$  being very long, gently sinuous; no trace of the tips of veins  $R^1$  or  $R^2$ ; r-m long, about one-half as long as cell first  $M^2$ ; basal deflection of  $Cu^1$  at midlength of cell first  $M^2$ . (Abdomen broken.)

*Hab.* Tasmania: Hobart (A. M. Lea). Type, I. 12165.

### **BRACHYPREMNA** Osten Sacken, 1886.

#### **BRACHYPREMNA** (?) **TIGRIVENTRIS** sp. nov.

General colouration dark brown, the mesonotum without distinct markings; head dark brown, narrowly yellowish adjoining the eyes; wings faintly brownish, stigma dark brown, followed and preceded by a subhyaline area; vein second A running very close to the anal angle of the wing; abdominal tergites dark brown, the sternites yellowish, the segments margined caudally with dark brown.

♀ Length, 14.5 mm.; wing, 15 mm.

Frontal prolongation of the head reddish-brown; nasus long and slender, black, dusted with grey, tipped with long, black bristles. Antennae brown, apparently only ten-segmented; flagellar segments gradually decreasing in length. Head dark brown, narrowly yellowish adjoining the margin of the eyes. Mesonotal praescutum, scutum and postnotum dark brown, without distinct stripes or markings of any kind (scutellum destroyed in pinning). Pleura light brown, sparsely variegated with darker areas, more conspicuous on the lateral sclerites of the postnotum. Halteres moderately elongated, brown, yellow at the base of the stem, the knobs dark brown. Legs with the coxae light brownish-

testaceous; trochanters brownish yellow (remainder of the legs broken). Wings with a brownish tinge; stigma oval, dark brown; subcostal cell a little darker than the remainder of the wing; cord and longitudinal veins beyond it indistinctly clouded and seamed with brown; conspicuous whitish-subhyaline areas before and beyond the stigma; veins brown, tips of veins  $M^2$ ,  $M^4$  and  $Cu^1$  pale at the wing-margin. Venation: Sc long,  $Sc^1$  ending about opposite two-fifths the length of  $R^{2+3}$ ;  $Sc^2$  a little removed from the tip of  $Sc^1$ ; the distance on costa between the tips of  $Sc^1$  and  $R^1$  is about two-thirds of r; Rs moderately long, gently arcuated;  $R^{2+3}$  a little shorter than Rs;  $R^2$  nearly at right angles to  $R^{2+3}$  at the fork, r joining near its base; petiole of cell  $M^1$  shorter than m; m-cu obliterated by fusion of  $Cu^1$  and  $M^{3+4}$ , vein second A running very close to and parallel with anal angle of wing, cell second A consequently very linear and of nearly uniform width for its entire length. Abdominal tergites brown, the caudal margin of the segments ringed with black, this including about the apical fourth of each segment; lateral regions of the tergites more yellowish; sternites yellow, the caudal margins of the segments narrowly and conspicuously banded with dark brown. Ovipositor yellowish horn-colour; tergal valves compressed, the apices bluntly rounded; sternal valves a little shorter than the tergal valves, the tips acute.

*Hab.* Queensland: Cairns district (A. M. Lea). Type, I. 12166.

The reference of this fly to the genus *Brachyremna* is entirely provisional. All of the known existing species of the genus are American. Several features of structure and colour of the present insect point strongly to *Brachyremna*, and it is placed therein until more material becomes available.

### CLYTOCOSMUS Skuse, 1890.

#### CLYTOCOSMUS SKUSEI sp. nov.

General colouration black, the mesonotum lined with silvery grey; pleura spotted with white, a triangular orange area before the wing-root; wings reddish-brown, the base brighter; abdomen black, the basal half of tergite two, all of tergites seven to nine, and the sternites orange.

♂ Length, 21 mm.; wing, 19-20 mm. Fore leg, femur, 9.3 mm.; tibia, 9.8 mm.; metatarsus, 4.5 mm.; remainder of fore tarsi, 7 mm.; middle leg, femur, 11.5 mm., tibia, 9.9 mm., metatarsus, 4.7 mm., remainder of middle tarsi, 8 mm.; hind leg, femur, 12 mm., tibia, 12.9 mm., metatarsus, 6.3 mm., remainder of hind tarsi, about 8 mm.

Head fiery-orange; palpi brownish-black. Antennae with the basal segment orange; remainder of the organ black; the first seven flagellar segments dilated into a cordiform structure, the branches being short and inconspicuous. much

shorter than in this sex of *C. helmsi*; segment two of the flagellum largest, thence gradually decreasing in size to the seventh; eighth flagellar segment slightly enlarged; terminal segments long-cylindrical with conspicuous verticils. Pronotum velvety-black. Mesonotal praescutum silvery-grey with three conspicuous velvety-black stripes that restrict the ground-colour to narrow lines; median stripe narrowed behind, cuneiform, anteriorly split by a very indistinct grey line; lateral stripes but narrowly separated from the median stripe; lateral margins of the sclerite narrowly blackened; scutal lobes grey, each lobe with the centres black, circled with grey; median area of the scutum and lateral margin of each lobe narrowly blackish; scutellum grey with a median black stripe; postnotum black with an anterior median grey spot. Pleura brownish-black, conspicuously variegated with white spots, these on the mesepisternum, mesepimeron, dorsal margin of the mesosternum, and the lateral sclerite of the postnotum before the origin of the halteres; propleura narrowly white; a white spot above the hind coxa; a conspicuous orange triangular area on the dorsal pleurites immediately caudad of the anterior spiracle and before the wing-root. Halteres black, the bases a little paler. Legs with the coxae conspicuously light grey pruinose; remainder of the legs black; claws of the male with two small teeth beneath. Wings with a strong reddish-brown tinge, much darker than in *C. helmsi* or *C. tillyardi*, brighter at the wing-base and in the costal and subcostal cells; cells M, Cu<sup>1</sup> and first A with small triangular paler centres. Abdominal tergites velvety-black, the basal half of segment two and segments seven to nine orange; the black tergites each have a conspicuous circular white spot at the lateral ends, and tergites two to five have an additional submedian spot near the anterior margin on either side; sternites fiery-orange, the caudal margins of segments four to six very narrowly blackish-brown.

*Hab.* New South Wales: Dorrigo. Type, I. 12167.

This magnificent crane-fly is dedicated to the late Frederick A. A. Skuse, the great pioneer student of Australian Tipulidae, author of the genus *Clytocosmus*. If it were not for the constancy between the sexes of *C. helmsi* Skuse as regards body colouration, I would have regarded this fly as representing the male sex of *C. tillyardi* Alexander; however, the colouration of the thorax of the two species is so nearly diametrically opposite that I cannot believe that they represent a single species. More material will settle the status of this fly. *C. lichtwardti* Riedel, recently described <sup>(1)</sup> from North Queensland, also has the colouration similar in the two sexes.

(1) Riedel, Arch. f. Naturgesch., lxxv, 1920, p. 85-88,

**PTILOGYNA Westwood, 1835.****PTILOGYNA MINIMA sp. nov.**

Size small (wing of male 12 mm.); head and thorax light yellow; wings pale brown, the base and costal margin more saturated; abdomen yellow, the tergites trivittate with brownish-black.

♂ Length, 13.2 mm.; wing, 12 mm.; antenna, 5.8 mm. ♀ Length, 14.5 mm.; wing, 11.3 mm.

Frontal prolongation of the head rather short, light yellow, infuscated laterally and beneath; palpi dark brown. Antennae yellow, the long branches dark brown. Head yellow, duller on the posterior portions of the vertex. Mesonotum dull yellow, the praescutum slightly darker medially. Pleura yellow. Halteres light brown, the knobs dark brown. Legs with the coxae and trochanters obscure yellow; remainder of the legs brown, the femora paler basally. Wings with a pale brownish tinge, the base and costal margin more saturated; no distinct whitish spots as in *P. ramicornis* (Walker). Venation: Third section of vein  $M^{1+2}$  longer than the second section ( $M^{1+2}$  plus  $R^{4+5}$ );  $R^{2+3}$  about twice  $R^2$ ; veins dark brown. Abdomen yellow, the tergites with a broad dark brownish-black median stripe; lateral margins narrowly dark brown; sternites brownish-yellow.

*Hab.* Northern Territory: Melville Island (W. D. Dodd). Type, I. 12168.

This tiny *Ptilogyne* is abundantly distinct from the widely distributed *P. ramicornis* (Walker).

**PHACELODOCERA Enderlein, 1912.**

The genus *Phacelodocera* was based on *Ptilogyne flabellifera* Loew, of Brazil. In this group the antennae are very similar to those of *Ptilogyne*, but the details of venation are almost exactly as in *Plusiomyia*, r-m and the petiole of cell  $M^1$  being present. The species here described is the second of the genus to be made known.

**PHACELODOCERA TASMANIENSIS sp. nov.**

Antennae with long flabellations; wings with a heavy brown pattern, streaked with hyaline; r-m and the petiole of cell  $M$  present; abdomen reddish, grey pruinose, the lateral margins blackish.

♂ Length, about 28 mm.; wing, 25 mm.; antenna, about 10 mm.; abdomen alone, 18.5 mm. Fore leg, femur, 14.7 mm.; tibia, 16.5 mm.; hind leg, femur, 15.8 mm.; tibia, 16.6 mm.

Frontal prolongation of the head long and slender, about as long as the remainder of the head, reddish, the dorsal half brown; mouth parts dark brown,

Antennae comparatively long, the first flagellar segment with a single long (about 3 mm.) flabellation; flagellar segments two to nine with three long flabellations, a pair of divergent, stronger, basal branches, the longest being about 4 mm. in length, and a more slender branch of subequal length just beyond midlength of the segment on the same face; the branches toward the end of the segment are shorter; the apical segments of the antenna taken together are a little longer than the terminal branch; first segment of the scape brown; remainder of the organ black. Head dark brown, the occiput more reddish. Pronotum reddish, grey pruinose. Mesonotal praescutum reddish, greyish-white pruinose, with three dark grey stripes that are indistinctly margined with darker; remainder of the mesonotum reddish, sparsely light grey pruinose. Pleura reddish, with a longitudinal stripe covered with a silky-grey bloom, the dorsal sclerites and the mesosternum darker brown to produce two longitudinal stripes that enclose a broad grey one. Halteres dark brown. Legs with the coxae reddish-brown, light grey pruinose; femora reddish-brown, the tips dark brown; tibiae and metatarsi reddish-brown, the tips narrowly blackened; tarsi blackish. Wings dark brown, the costal, subcostal and base of the radial cell somewhat brighter; anal cells more greyish; the wing is variegated with whitish-hyaline, the pattern being strikingly like that of *Plusiomyia pandora*; a large hyaline blotch on the outer half of cell M; cell first M<sup>2</sup> hyaline, sending forth three interrupted rays; a narrow one obliquely to the costa across the bases of cells R<sup>2</sup>, R<sup>3</sup>, R<sup>5</sup> and the extreme tip of cell second R<sup>1</sup>; the second ray includes almost all of cell R<sup>5</sup> excepting a narrow brown interruption at about one-third the length of the cell; the third ray is broad and includes only the basal portions of cells second M<sup>2</sup> and M<sup>4</sup>; cell Cu<sup>1</sup> is dark, only the centre being indistinctly paler; cell Cu hyaline, the base dark brown, the apical third greyish, enclosing an oval hyaline area; anal cells broadly hyaline basally, greyish-brown apically, a narrow hyaline ray in cell first A near vein second A continued to the anal margin. Venation: r-m longer than m-cu; petiole of cell M<sup>1</sup> a little shorter than m. Abdomen reddish, the tergites beyond the second greyish-pruinose, except dorso-medially and laterally; lateral margins of the segments broadly blackened, these areas narrow anteriorly, broadened behind; a broad dark brown dorso-median stripe, this interrupted at the posterior margin of each segment; sternites reddish-brown, sparsely pruinose.

*Hab.* Tasmania: Waratah (H. J. Carter and A. M. Lea). Type, I. 12169.

**PLUSIOMYIA Skuse, 1890.**

**PLUSIOMYIA PANDORA sp. nov.**

Mesonotum dark grey, the praescutum with four dull violaceous stripes; a narrow arcuated brown band across the scutellum; pleura silky-grey with three

narrow dark brown longitudinal stripes; wings dark brown; a whitish-subhyaline area in the outer end of cell M that splits into three rays at cell first  $M^2$ , one going to costa in cell  $R^2$ , one to the wing-tip in cell  $R^5$ , the third to the posterior margin in cell  $M^4$ ; lateral margins of the abdominal tergites dark brown.

♂ Length, 26-30 mm.; wing, 25-27 mm.; abdomen alone, 17-21 mm.

Frontal prolongation of the head reddish; palpi dark brown. Antennae with the scapal segments reddish, the flagellum dark brown; first flagellar segment produced strongly ventrad at apex; pectinations of flagellar segments two to seven about one-half longer than the segments. Head reddish-purple, the anterior portion of the vertex and a broad margin adjoining the eyes light grey. Pronotum light grey, cinnamon-brown medially. Mesonotal praescutum dark grey with four rather narrow dull violaceous stripes, the intermediate pair separated by a narrow line of the ground-colour; scutum grey, the lobes largely dull violaceous; a narrow dark chestnut band extends from each wing-root across the posterior part of the scutellum; postnotum pale grey pruinose, the posterior margin of the median sclerite and the ventral half of the lateral sclerites above the halteres chestnut. Pleura and sternum with a light grey silky bloom, with three more or less evanescent narrow chestnut-brown longitudinal stripes, the most dorsal one occupying the dorso-pleural membranes; the second, broadest, extending from the ventral ends of the propleura above the fore coxae to the base of the halteres; the most ventral stripe occupying the mesosternum; the area between the ventral and intermediate stripes is broader than the latter; these dark stripes are best seen when the insect is viewed from before; viewed from behind they are quite invisible. Halteres brown, the knobs obscure brownish-yellow. Legs with the coxae reddish, light grey pruinose; trochanters dark reddish-brown; femora reddish, the tips indistinctly darkened; tibiae obscure brownish-yellow, darkened apically, the extreme tips indistinctly infuscated; tarsi brown. Wings dark brown, the costal and subcostal cells more yellowish-brown; cells Cu, first A and second A more greyish, subhyaline basally; a large oval whitish-subhyaline area in cell R before the origin of  $R_s$ ; a large blotch occupying the outer half of cell M, passing through cell first  $M^2$  and there splitting into three rays, the first narrow, traversing the bases of cells  $R^2$  and  $R^3$ ; the second including most of cell  $R^5$  and the extreme tip of  $R^3$ , the third including the base of cell second  $M^2$  and all of  $M^4$  except the anterior outer angle; thus there appears an outer longitudinal white stripe, crossed by an arcuate similar band that extends from margin to margin; cell Cu<sup>1</sup> grey, the surrounding veins heavily margined with dark brown. Wings broader than in *P. gracilis*. Venation: Cell  $M^1$  short-petiolate. Abdomen reddish; lateral margins of the tergites broadly dark brown. Male hypopygium of simple structure.

*Hab.* Tasmania (A. Simson, No. 3846). Type, I. 12170.

**PLUSIOMYIA TRIPECTINATA** sp. nov.

Similar in general appearance to *P. pandoxa*; flagellar segments two to six with a slender pectination beyond midlength of each segment, in addition to the usual basal pair; wing-pattern heavier, especially in the anal cells.

♂ Length, 25 mm.; wing, 24.5–26 mm.; abdomen alone, 18 mm.

Very similar in general appearance to *P. pandoxa*, differing as follows:

Basal flagellar segment with a slender finger-like lobe immediately before the tip; segments two to six, in addition to the slender basal branches, with a shorter but conspicuous third branch just beyond midlength of the segment; seventh flagellar segment without the apical branch and apparently with but a single basal branch. Stripes on the praescutum duller grey. Wings narrower; the wing-pattern very similar to that of *P. pandoxa*, the chief differences as follows: The white band in cell  $R^5$  is narrowly interrupted by a brown line before the fork of  $M^{1+2}$ ; the posterior ray from cell first  $M^2$  does not reach the posterior margin, but ends at near midlength of cell  $M^4$ ; outer ends of the anal cells brownish-grey, heaviest along vein second  $A$ ; a whitish ray in cell first  $A$  reaching the wing-margin near vein second  $A$ ; cell  $Cu$  hyaline with the distal end and a mark at two-thirds the length narrowly brown. Abdomen shorter, the lateral margins darker.

*Hab.* Tasmania: Magnet, Waratah (A. M. Lea). Type, 12171.

The antennal structure is very distinct from that in other members of the *gracilis* group.

**PLUSIOMYIA (?) FELIX** sp. nov.

Mesonotum light grey, the praescutum with three reddish-brown stripes; a conspicuous tubercle on the lateral sclerite of the postnotum before the root of the halter; wings greyish-subhyaline, the cord and longitudinal veins narrowly seamed with brown; abdominal tergites reddish-brown, the lateral margin of each segment with silver-grey triangles.

♂ Length, 26 mm.; wing, 24.3 mm.

Frontal prolongation of the head reddish; palpi dark brown. Antennae with the scapal segments reddish-brown (flagellum broken). Head with the vertex behind the antennal bases shiny-reddish; remainder of the vertex dusky-grey, a little more reddish adjoining the inner margin of the eyes. Mesonotal praescutum light grey with three conspicuous reddish-brown stripes that are weakly pruinose; median stripe split by a capillary line of ground-colour except at the posterior end; scutal lobes and lateral margins of the scutellum largely reddish; median area of scutum and scutellum light grey-pruinose; postnotum reddish,



heavily light grey-pruinose. Lateral sclerites of the postnotum immediately before the root of the halteres produced laterad into conspicuous tubercles. Pleura light grey-pruinose; a reddish triangle on the mesepisternum; mesosternum reddish. Halteres brown, the knobs light yellow. Legs with the coxae light grey; trochanters reddish-brown; femora reddish-brown, the tips narrowly blackish (remainder of the legs broken). Wings greyish-subhyaline; cell C more yellowish; cell Sc narrow, fulvous; stigma pale yellowish-brown; cord seamed with brown; longitudinal veins very narrowly seamed with brown, broader on M. Venation: As in *P. pandora*; vein  $R^3$  longer than  $R_s$ ;  $R^{4+5}$  strongly sinuated at midlength; petiole of cell  $M^1$  about equal to r-m; cell first  $M^2$  shorter, the basal deflections of  $M^{1+2}$  and  $M^{3+4}$  subequal. Abdominal tergites reddish-brown with the lateral margins conspicuously silvery-grey; median line duller grey; tergite one entirely dull grey; the lateral triangles are most distinct on segments two to seven; the dorso-median grey line is narrowly interrupted at the posterior margins of the segments; sternites reddish, sparsely grey pruinose.

*Hab.* Tasmania (A. Simson, No. 3262). Type, I. 12172.

The reference of this crane-fly to *Plusiomyia* is rendered somewhat doubtful by the loss of the antennae. However, the other details of structure agree, and it is highly probable that the above reference is correct.

### PLUSIOMYIA MINOR sp. nov.

Size small (wing of female under 13 mm.); general colouration dark brown, the thorax without distinct stripes; first scapal segment very long and slender; flagellar segments two to seven with a pair of basal branches and a smaller blunt subterminal branch; wings greyish-subhyaline, unmarked; abdomen brownish-black.

♀ Length, about 12 mm.; wing, 12.6 mm.

Frontal prolongation of the head slender, only a trifle longer than the remainder of the head, reddish-brown, passing into dark brown at the tip; palpi dark brown. Antennae with the first scapal segment long and slender as in *P. inornata*, about as long as the frontal prolongation of the head or nearly one-third of the entire antennal length; first flagellar segment with an apical triangular tooth; flagellar segments dark brown; segments two to seven branched, the longest branch scarcely a third longer than the segment that bears it; the minute third branch of each of these six flagellar segments is situated just before the tip of each segment; terminal six segments of the flagellum simple. Head dusky grey; vertex between the eyes narrow. Mesonotum rather dark brown without distinct stripes. Pleura dark brownish-testaceous without markings. Halteres brown, the knobs dark brown. Legs with the coxae and trochanters

brownish-testaceous; remainder of the legs darker brown. Wings greyish-subhyaline, unmarked with darker; cell Sc and the stigma a little darker; veins brown. Venation: Rs and  $R^{2+3}$  subequal in length; cell  $M^1$  broadly sessile; cells  $M^1$ , second  $M^2$  and  $M^4$  parallel and approximately subequal in length and breadth. Abdomen brownish-black, probably with a brown bloom in fresh specimens. Ovipositor with the valves dark brownish horn-colour.

*Hab.* North Queensland: Cairns district (A. M. Lea). Type, I. 12173.

*P. minor* is the smallest species of the genus known. It is closest to *P. inornata* Skuse, and belongs to this group or subgenus. It differs from *inornata* in its very small size, the shorter flagellar pectinations, and the details of colouration.

### **PLUSIOMYIA SPISSIGRADA sp. nov.**

Female subapterous; wings considerably atrophied both in length and breadth.

♀ Length, about 33 mm.; wing, 12 mm.; abdomen alone, excluding the ovipositor, about 22 mm.

Frontal prolongation of the head moderately elongated, a little longer than the remainder of the head, with no indication of a nasus, reddish-brown in colour; mouth-parts darker. Antennal scape dark brown (flagellum broken). Head dark grey, narrowly paler adjoining the inner margins of the eyes. Pronotum very thin, deep reddish-brown. Mesonotal praescutum testaceous-brown with a dark brown median stripe, the median line of the praescutum with a distinct, shallow, longitudinal fovea; lateral stripes obscure yellow, darker laterally; scutum brown, the median area and inner portions of the lobes obscure yellow; scutellum brown, the posterior half of the median lobe yellowish; postnotum reddish-brown; lateral sclerites of the postnotum more pruinose; a conspicuous transverse ridge across this sclerite before the halter, as in the genus. Pleura reddish-brown, the mesepimeron and lateral sclerite of the postnotum more yellowish. Halteres brownish-yellow. Legs with the coxae and trochanters reddish-brown; femora reddish-brown, becoming dark brown at the tips (remainder of the legs broken). Wings considerably atrophied both in length and breadth so as to render the fly incapable of flight, the venation correspondingly distorted; wings dirty grey, the basal and costal regions more yellowish. Venation: Costa twice bellied outward, more strongly so opposite the stigmal region; cell  $M^1$  entirely sessile; veins stout, the cells correspondingly reduced. Abdomen large and filled with eggs, dark reddish-brown; pleural region duller (the tips of the ovipositor are broken, but the shields of both valves are dark shiny brown).

*Hab.* Tasmania: Frenchman's Cap (J. E. Philp). Type, I. 12174.

In spite of the fact that the antennal flagella are broken and that the wing-venation is distorted by the atrophy of the wing, there can be scarcely any doubt that the generic reference as given is correct. The peculiar shape of the head and the strong transverse ridge on the lateral sclerites of the postnotum are well-defined characters of *Plusiomyia*. The discovery of nearly apterous members of this genus is of exceptional interest.

**PLUSIOMYIA NECOPINA sp. nov.**

Female subapterous; wings reduced to mere strap-like organs.

♀ Length, about 24 mm.; wing, about 5.5 mm.; abdomen alone, 19 mm.

Frontal prolongation of the head slightly longer than the remainder of the head, brown; basal segments of palpi more yellowish; remainder of mouth-parts darker brown. Antennae (broken beyond the scape), first scapal segment dull yellow, tipped with darker; second segment yellow. Head with a light yellow pollen; vertex and occiput with a conspicuous dark brown area that restricts the ground-colour to margins adjoining the eyes; this dark mark on the vertex broadens out toward the occiput. Pronotum not so thin and plate-like as in *P. spissigrada*, brown, darker medially. Mesonotal praescutum light yellowish-brown with three darker brown stripes; scutum brown, the median area paler (scutellum badly injured in pinning); postnotum light coloured, slightly pruinose; the ridge on the lateral sclerites of the postnotum occurring in this genus scarcely evident. Pleura pale brown, sparsely grey pruinose. Halteres pale brown, the knobs darker brown. Legs with the coxae pale greyish-brown; trochanters obscure yellow; femora light brown, more yellowish basally (the tips broken). Wings brown, short, and so narrow as to appear strap-like; venation so crowded as to be scarcely apparent; the region of the areculus is beyond one-third the wing-length. Abdomen obscure brownish-yellow, the tergites with two parallel narrow dark brown stripes that are more or less interrupted, the space between about equal in width to one of them; sternites obscure yellow, the basal half of the segments slightly darker, pleural membrane darker brown. Ovipositor with the valves powerful, shiny dark brown; tergal valves slender, lying transversely, the lateral margins feebly serrulate, the tips slightly expanded; sternal valves very large and powerful, nearly black, much stronger than the tergal valves, the two together appearing like a long acute point; the structure of the tergal valves is much like that found in the *arctica* group of the genus *Tipula*, but the sternal valves are very different, being as large and powerful as any other species of Tipulid known to the writer.

*Hab.* Tasmania: Gladstone (J. E. Philp). Type, I. 12175.

**PHYMATOPSIS Skuse, 1890.****PHYMATOPSIS BREVIROSTRATA sp. nov.**

Antennae with twelve segments in the male; flagellum brown; mesonotum obscure yellow, the praescutum with three broad blackish stripes that are confluent, or nearly so; wings whitish-subhyaline with conspicuous brown cross-bands; Rs short; abdomen black, the tergites with yellowish bases in the male, more greyish in the female.

♂ Length, 7.5–8 mm.; wing, 9–10.8 mm. ♀ Length, 10 mm.; wing, 9 mm.

Frontal prolongation of the head short and stout, strongly arched at about midlength; no distinct nasus, but a tuft of four or five bristles at this point; palpi dark brown. Antennae rather short, twelve-segmented in the male; first flagellar segment pyriform; remaining segments gradually decreasing in size, but increasing in length to the terminal one; scape obscure yellow, flagellum brown. Head yellowish-grey, the vertex with a large triangular brown blotch. Mesonotal praescutum obscure yellow with three broad blackish stripes that are confluent or nearly so, the median stripe very narrowly split by a capillary pale line; scutal lobes black; scutellum yellowish-testaceous; postnotum dark brown, blackish posteriorly, this colour continued laterad on to the lateral sclerites of the postnotum and appearing as a large blotch before the root of the halter. Pleura pale brownish-yellow, sparsely pruinose. Halteres dark brown, the basal half of the stem light yellow. Legs with the coxae and trochanters light yellow; femora yellowish-brown, the tips narrowly blackened; tibiae dark brown, the tips blackened; tarsi black. Wings whitish-subhyaline with cross-bands of brownish; cells C and Sc more yellowish; stigma dark brown, suffusing all of cell Sc<sup>1</sup> and the outer half of first R<sup>1</sup>, continued caudad as a broad seam along the cord to the fork of M; broad brown cross-bands in the basal cells, one at the arculus; the second near midlength of the basal cells; wing-apex and the posterior and anal cells greyish-brown; the conspicuous whitish bands left are before and beyond the cord and near the wing-base. Venation: Rs short, arcuated at origin, shorter than R<sup>2+3</sup>; petiole of cell M<sup>1</sup> shorter than r-m; cell second A very narrow; Cu<sup>2</sup> about twice the deflection of Cu<sup>1</sup>. Abdominal tergites two to six obscure yellow, the caudal margins broadly black, the remaining tergites black; lateral margins broadly greyish-yellow; sternites brownish-yellow.

The female referred to this species is much darker in colour, the black including the entire thorax; the wing is more uniformly darkened, the band at the cord being very broad, restricting the white markings before and beyond the cord to small oval areas; cell second A broader; bases of abdominal tergites more greyish than yellow.

*Hab.* New South Wales: Dorrigo (W. Heron). Type, I. 12176.

Although this handsome little fly deviates in some important respects from the definition of *Phymatopsis* there is no other group that can receive it, and it seems best to place it in the present genus, although, like *P. brevipalpis* Alexander, it is aberrant in several points.

**SEMNOTES Westwood, 1876.**

**SEMNOTES REGIFICA sp. nov.**

General colouration yellow; mesonotal praescutum with three confluent transverse black stripes that do not attain the suture; legs black, the tibiae with a broad yellow ring beyond the base; wings dark brown, a conspicuous yellow band at the base of the wing and an oval yellow spot near the origin of Rs.

♀ Length, about 22 mm.; wing, 29.5 mm.; fore leg, femur, 12.2 mm.; tibia, 16.4 mm.; metatarsus, 20.5 mm.; middle leg, femur, 15 mm.; tibia, 16.3 mm.; metatarsus, about 24 mm.; hind leg, femur, 17 mm.; tibia, 20.5 mm.; metatarsus, about 30 mm.

Frontal prolongation of the head short, light yellow, the nasus stout, decurved; palpi with the basal segments yellow, the terminal segments brown. Antennae with the first scapal segment nearly as long as the remainder of the organ taken together, yellow; remainder of antennae brownish-yellow. Head orange-yellow. Pronotum yellow; lateral margins and a confluent spot on either side of the narrow yellow median area dark brown. Mesonotal praescutum yellow with three broad black stripes, the median stripe broad but short, becoming obsolete near midlength of the segment; lateral stripes short, attaining the lateral margins of the sclerite in front of the root of the wing, confluent with the median stripe, not attaining the suture; scutal lobes yellow, each with two conspicuous isolated brownish-black spots along the anterior margin in transverse alignment; scutellum yellow, the caudal margin of the median area dark brown; postnotum yellow. Pleura yellow; mesopleura dark brown, sparsely variegated with obscure yellow; propleura black; a large oval brownish-black spot on the lateral sclerites of the postnotum before the root of the halteres. Mesosternum dark brown. Halteres dark brown, the base of the stem yellowish. Legs with the coxae obscure yellow, the outer faces suffused with dark brown; trochanters with the outer faces infuscated; femora black, the bases narrowly and indistinctly paler; tibiae with the extreme base (1.3 mm.) brownish-black, the distal half similar, the intervening space broadly (6.3 mm.) and conspicuously light yellow; tarsi black. Wings dark brown; a conspicuous yellow cross-band just beyond the wing-root, the outer margin at areulus; an oval yellow spot near the middle of the wing in cells R and M, immediately before the origin of Rs; centres of cells M, Cu<sup>1</sup> and the anal

cells paler than their margins. Venation: Rs shorter than  $R^{2+3}$ ; basal deflection of  $R^2$  perpendicular;  $R^3$  longer than  $R^{2+3}$ ; petiole of cell  $M^1$  and m subequal. Abdominal tergites testaceous-yellow, the median line and the caudal margins of each segment black, to form an inverted T on each segment, the lateral margins most distinct on tergites two to five; sternites obscure yellow, the caudal margins of the segments narrowly blackened; distal abdominal segments with a slight silvery bloom. Ovipositor very short and blunt as in the genus.

*Hab.* North Queensland: Kuranda (F. P. Dodd). Type, I. 12177.

**HABROMASTIX Skuse, 1890.**

**HABROMASTIX HERONI sp. nov.**

General colouration brownish-yellow; vertex with a conspicuous dark brown mark; praescutum with three broad dark brown stripes, the median one split by a pale line; postnotum darkened posteriorly; femora broadly blackened at tips; wings greyish-brown, variegated with pale yellow;  $R^{2+3}$  longer than cell first  $M^2$ ; basal section of vein  $M^{3+4}$  more than twice the second deflection.

♂ Length, 14–14.5 mm.; wing, 16.5–17 mm.; antenna, about 14.5–15 mm.

Rostrum slender, yellowish above, dark brown laterally and beneath; palpi dark brown. Antennae with the scape and basal two segments of the flagellum light brownish-yellow, passing into dark brown. Head with the front narrowly grey pruinose; vertex yellow, more fulvous on the tubercle, paler adjoining the eyes, a conspicuous dark brown median stripe, narrowed in front, broadest behind. Mesonotal praescutum brownish-yellow with three broad dark brown stripes, the median stripe split by a capillary pale line, all the stripes attaining the suture; scutal lobes dark brown, the median area narrowly pale; scutellum with the median sclerite dark brown, the lateral regions pale; postnotum whitish-grey, the posterior half conspicuously dark brown, continued to before the root of the halteres. Pleura light brownish-grey, indistinctly striped longitudinally with darker grey. Halteres light brown, the base of the knob darker brown. Legs with the coxae brownish-yellow, the apical half of the outer faces of the fore and middle coxae darker; trochanters obscure yellow; femora light brownish-yellow, the tips broadly and conspicuously blackened; tibiae brownish-black, only the extreme bases brightened; tarsi brownish-black. Wings with a strong greyish-brown tinge, the costal and subcostal cells more yellowish-brown; stigma darker brown; the wing is conspicuously variegated with pale yellow spots and areas, distributed as follows: a small band beyond the areculus extending across the wing but interrupted behind vein Cu; a second larger V-shaped band extends across the wing, the point of the V near midlength of cell M, this area traversing cell Cu; conspicuous areas before the cord and stigma; beyond the stigma in

cell  $R^2$ ; in the bases of cells second  $M^2$  and  $M^4$  and near the end of vein  $Cu$ , this latter including considerable portions of cells  $M$ ,  $Cu^1$ , and  $Cu$ ; a small circular spot near the end of vein  $Cu^2$  in cell  $Cu^1$ ; the dark brown streak enclosed between vein  $Cu$  and the weak vein immediately behind it ( $Cu^2$  of Tillyard) is thus crossed only by two pale areas; veins dark brown. Venation:  $Sc^2$  ends between one-third and one-fourth the length of  $R^{2+3}$ ;  $R^{2+3}$  longer than cell first  $M^2$ ; cell first  $M^2$  widened outwardly, the basal section of  $M^{3+4}$  more than twice the second section; cell  $M^1$  very short-petiolate to narrowly sessile. Basal abdominal tergites reddish-brown, beyond the third passing into blackish, the lateral margins of each segment with a conspicuous brownish-yellow triangle, this colouration narrowly and indistinctly continued across the posterior margin; basal sternites obscure yellow, beyond the fifth passing into black.

*Hab.* New South Wales: Dorriga (W. Heron). Type, I. 12178.

This handsome species, which is most nearly related to *H. ornatipes* Skuse and *H. terrae-reginae* Alexander, is named in honour of its collector, Mr. W. Heron, who has added several species of crane-flies to the list from New South Wales.

### ACRACANTHA Skuse, 1890.

#### ACRACANTHA TASMANIENSIS sp. nov.

Face clear light yellow, the vertex behind the tubercle light violaceous; a narrow dark brown dash adjoining the inner margin of the eyes; mesonotum shiny-reddish, tinged with violaceous; a brownish-black triangle before the wing-root; femora brownish-yellow, the tips broadly blackened; wing subhyaline, the longitudinal veins beyond the cord bordered with brown; petiole of cell  $M^1$  very short.

♀ Length, 22 mm.; wing, 20 mm.; fore leg, femur, 11.3 mm., tibia, 11.8 mm.; hind leg, femur, 12.8 mm.; tibia, 13.7 mm.; tarsus, 22.8 mm.

Frontal prolongation of the head rather short, light brown; nasus long and slender, provided with conspicuous black bristles; palpi brown. Antennae with fifteen segments (in the female); scape reddish-brown, the flagellum dark brown; first scapal segment elongate; basal six flagellar segments enlarged, the inner face of each a little produced and without bristles; remaining seven flagellar segments elongate-cylindrical, provided with very long, conspicuous verticils on all sides. Front and anterior face of the vertical tubercle clear light yellow; vertex and occiput light violaceous; a narrow dark brown mark on the vertex adjoining the inner margins of the eyes, this sending a capillary point cephalad and slightly proximad on to the vertical tubercle; occiput darkened. Pronotum clear light yellow. Mesonotal praescutum shiny-reddish with a faint violaceous tinge; a

rather broad but ill-defined median stripe, split by a capillary darker median line; scutal lobes reddish, the median area more yellowish; scutellum reddish-brown, the median area yellow; two brown spots at the base of the median sclerite; postnotum shiny reddish-brown, the lateral sclerites paler, especially ventrally, with a circular brown spot before the root of the halteres. Pleura faintly reddish; a broad, light yellow longitudinal stripe extending from the propleura to the base of the abdomen, slightly interrupted near the wing-root; a conspicuous brownish-black triangular area before the root of the halteres; a ventral brownish-violaceous longitudinal stripe extending from the propleura across the fore coxa and dorsal margin of the mesosternum. Halteres light brown, the knobs darker. Legs with the outer faces more or less violaceous; trochanters yellow; femora brownish-yellow, the tips broadly (3 mm.) and abruptly blackened; tibiae brown, the base narrowly yellowish, the apex narrowly blackened; tarsi dark brown. Wings subhyaline, the stigma and costal region brownish-yellow; cells second  $R^1$ ,  $R^2$ , and apex of  $R^3$  yellowish; veins beyond the cord conspicuously seamed with brown; linear brownish streaks in cell R, and less distinctly in cell M; anal cells greyish, a clear streak in cell first A, adjoining vein second A; veins dark brown. Venation: Rs longer than  $R^{2+3}$ , gently arcuated;  $R^3$  a little longer than Rs; petiole of cell  $M^1$  very short, less than r-m; m-cu present, but short. Abdominal tergites reddish-brown, segments five to eight darker; sternites obscure yellow with a broad blackish median stripe. Ovipositor reddish horn-colour, the tergal valves slender; sternal valves flattened, the tips subaente.

*Hab.* Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12179.

### **ACRACANTHA ABNORMALIS** sp. nov.

Antennae twelve-segmented in both sexes; basal six flagellar segments inercassated, the terminal four without long verticils as usual in the genus; mesonotum buffy-yellow, the praescutum with four dark brown stripes; pleura silvery-grey; wings faintly greyish; basal abdominal tergites fulvous, the remaining segments more brownish.

♂ Length, about 11 mm.; wing, 14.5 mm. ♀ Length, about 18-20 mm.; wing, 16-20 mm.

Frontal prolongation of the head brown, dusted with grey; nasus long and slender; palpi dark brown. Antennae twelve-segmented in both sexes; scapal segments brownish-yellow; flagellum dark brown; the six basal flagellar segments subcylindrical, gradually decreasing in length from the first to the fourth, the fifth a little shorter than the third; these basal segments have no verticils on their inner face, those on the outer face appressed; the terminal four segments elongate, the last three especially so; verticils inconspicuous. Head dark brown medially,



narrowly buffy-grey adjoining the inner margins of the eyes; in the female the sides of the vertex and genae are grey; a small, button-like tubercle on the vertex between the antennal bases. Mesonotal praescutum buffy, the margins with a light yellowish pollen; four narrow dark brown stripes, the intermediate pair paler at their anterior ends; scutal lobes dark; scutellum and postnotum dark brown, dusted with grey, the postnotum with a capillary dark brown median line. Pleura light silvery pruinose, slightly darker on the mesepisternum; dorso-pleural membranes dark brown. Halteres brown, the base of the stem yellowish. Legs with the coxae brown, dusted with light grey; trochanters brownish-yellow; femora brownish-yellow, the tips narrowly darkened; tibiae light brown, the tips dark brown; tarsi dark brown. Wings with a faint greyish tinge; cells Sc and the stigma brown, the latter continued into cells Sc<sup>1</sup> and second R<sup>1</sup>; a brown seam at the fork of Cu. Venation: R<sup>2</sup> oblique, the terminal section gently arcuated, so that cell second R<sup>1</sup> is widest just beyond the base; r is provided with about a dozen strong macrotrichiae and appears as a continuation of vein R<sup>1</sup>, all the other veins excepting C' being destitute of macrotrichiae; petiole of cell M<sup>1</sup> shorter than m; basal deflection of M<sup>1+2</sup> about equal to and parallel with m; m-cu obliterated by the punctiform fusion of Cu<sup>1</sup> and M<sup>3+4</sup>. Abdominal tergite one greyish-pruinose; remaining segments brown, the second tergite more fulvous. Ninth tergite of the male hypopygium with a deep V-shaped notch, the margins thus formed densely set, provided with stiff black bristles; pleural appendage appearing as a simple subelavate hairy lobe. In the female, the second to fourth tergites are more or less yellowish, the remaining tergites dark; sternites brownish-yellow. Ovipositor reddish horn-colour. In the paratype male from Scottsdale the abdomen is almost uniformly brownish-yellow and only five basal flagellar segments are incrassated; in the female, the sixth to eighth abdominal segments are broadly blackened caudally.

*Hab.* Tasmania: Devonport, Scottsdale, Huon River, Hobart, King Island (A. M. Lea); Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12180.

### ISCHNOTOMA Skuse, 1890.

#### ISCHNOTOMA PRIONOCEROIDES sp. nov.

General colouration dark, grey pruinose; antennae subserrate, in the female sex; wings faintly brownish, sparsely variegated with whitish-subhyaline areas; femora dark brown, the basal third rufous; abdomen blue-black, the segments very narrowly margined caudally with pale.

♀ Length, 17.5–18 mm.; wing, 17.3 mm.

Frontal prolongation of the head dark, the nasus comparatively short; palpi brownish-black. Antennae dark brown, twelve-segmented; basal three flagellar

segments subcylindrical; fourth to eighth narrowed basally, widened distally, the apex of each truncated, giving the flagellum a subserrate appearance; two apical segments more elongate. Head dark blue-black, pruinose. Mesonotum badly discoloured in the type, blue-black, light grey pruinose; the praescutum apparently has darker longitudinal stripes, including a capillary median vitta. Pleura grey, almost whitish immediately before the halteres, provided with conspicuous whitish hairs, longest and most conspicuous on the lateral sclerites of the postnotum. Halteres light brown. Legs with the coxae dark, light grey pruinose; trochanters dark brown; femora dark brown, the basal third, or slightly more, conspicuously rufous; tibiae reddish-brown, the tips darkened; tarsi brownish-black. Wings with a faint brownish tinge, sparsely variegated with whitish subhyaline; cells C and Sc more yellowish; stigma brownish; the whitish areas occupy the basal half of cell  $R^2$ ; outer half of cell first  $M^2$ ; most of cells  $M^1$  and second  $M^2$ ; apices of cells M and  $M^4$ , and less distinctly in the bases of cells Cu,  $M^1$ , and the anal cells; veins dark brown. Venation: Rs moderately long, a little shorter than  $R^3$ ; r rather faint, oblique, inserted on  $R^2$  shortly beyond the fork;  $R^{2+3}$  a little longer than  $R^2$ ; petiole of cell  $M^1$  about two-thirds of m; basal deflection of  $M^{1+2}$  about equal to m and parallel with it; m-cu punctiform;  $Cu^2$  about one-half longer than the deflection of  $Cu^1$ . Abdomen blue-black, pruinose; caudal margins of the segments very narrowly and indistinctly margined with paler, less distinct on segment two, gradually widening to the sixth and seventh segments. Terminal segments of the abdomen narrowed; ovipositor relatively small, the tergal valves long and slender; sternal valves much shorter, compressed, the tips obtusely rounded.

*Hab.* Tasmania: Summit of Mount Wellington (A. M. Lea). Type, l. 12181.

*I. prionoceroides* is a very distinct species of the genus. The resemblance to species of the northern genus *Prionocera* Low is surprising.

### ISCHNOTOMA RUBROABDOMINALIS sp. nov.

Vertical tubercle small, reddish, less distinctly so in the female; mesonotal praescutum with three grey stripes that are narrowly margined with dark brown, the median stripe split by a capillary dark brown line; legs black, only the bases of the femora brighter; abdomen reddish, the segments greyish-pruinose laterally; segments eight and nine dark brown.

♂ Length, 13.5–15 mm.; wing, 15–16 mm. ♀ Length, 16–18 mm.; wing, 14–16.4 mm.

Frontal prolongation of the head dark brown, pruinose; nasus long and slender; palpi dark brown. Antennae dark brown, the first scapal segment pruinose; in the male the first flagellar segment is elongate-cylindrical, the second

and third shorter, subcylindrical; fourth to ninth short, the inner face produced slightly to give the segments a roughly triangular appearance; terminal (twelfth) segment cylindrical, filiform. In the female; the antennae appear to be only eleven-segmented, the subterminal segments serrated as in the male, but less distinctly so. Head dark, greyish-pruinose, narrowly rufous medially; vertical tubercle reddish, infuscated medially, indistinctly trifold anteriorly; in the female this tubercle is obscure reddish-brown. Mesonotal praescutum with the interspaces buffy-grey; stripes grey, narrowly but conspicuously margined with dark brown, the lateral margins of the median stripe becoming narrowed behind and finally obliterated beyond three-fourths the length of the segment; median stripe split by a capillary dark brown line that ends immediately before the suture; margins of the lateral stripes complete, crossing the suture; scutum light grey, the lobes darker grey, each with a dark brown semicircle that is confluent with the margins of the lateral praescutal stripes; scutellum and postnotum clear light grey with a capillary brown line, the lateral margins of these sclerites a darker grey. Pleura light grey, narrowly darkened dorsally, before the wing-root with a conspicuous triangular tubercle that is dark brown, the apex conspicuously orange. Mesosternum greyish-brown. Halteres light brownish-yellow, the knobs dark brown. Legs with the coxae light grey; trochanters dark brownish-grey; femora black, the bases narrowly fulvous; remainder of the legs black. Wings with a greyish tinge; stigma pale brown; wing-surface sparsely variegated with dusky, these areas including the end of cell  $R^2$ ; an area near the end of cell M adjoining vein Cu and narrow seams to the veins; outer ends of the anal cells faintly darkened; an indistinct oblitative area before the stigma, crossing cell first  $M^2$  into the base of cell  $M^4$ ; veins dark brown. Venation:  $R^{2+3}$  a little longer than  $R^2$ ; Rs longer than  $R^{2+3}$  but shorter than  $R^3$ ; petiole of cell  $M^1$  about equal to m; m-cu short but indicated. Abdominal tergite one buffy-grey, infuscated dorso-medially; tergites two to seven bright fulvous, the segments conspicuously margined laterally with light grey; sternites similar but more brownish-fulvous, the basal segments slightly pruinose; segments eight and nine dark brown. Ninth tergite narrowly margined laterally with fulvous. In the female, the bright colour includes the eighth tergite. Male hypopygium having the ninth tergite large, with a broad U-shaped median notch, the lateral angles broadly rounded. Ovipositor with the valves long and slender.

*Hab.* Tasmania: Waratah (H. J. Carter and A. M. Lea). Type, I. 12182.

**MACROMASTIX Osten Sacken, 1886.**

**MACROMASTIX BREVIPETIOLATA sp. nov.**

Nasus powerfully developed; antennae short; head orange-yellow; mesonotum shiny testaceous-brown, the pleura more yellowish; wings strongly suffused with

brown, the costal and subcostal cells and the stigma more yellowish; petiole of cell  $M^1$  very short.

♂ Length, about 11-12 mm.; wing, 14 mm. ♀ Length, about 9 mm.; wing, 12 mm.

Frontal prolongation of the head rather short, obscure yellow, the nasus very long and powerful, tufted with hairs at the apex; palpi dark brown. Antennae apparently thirteen-segmented, short in both sexes; the first scapal segment yellowish; second segment yellowish-brown; flagellum dark brown, the basal three segments oval, gradually decreasing in size, beyond the third the segments of the flagellum are elongate, linear, provided with only sparse, though moderately long verticils (segmentation of the flagellum difficult to determine in dried material). Head bright orange-yellow, clearest on the anterior part of the vertex, more obscure on the occiput. Mesonotum rather shiny testaceous-brown without distinct markings, only the posterior third of the postnotum being a little darker. Pleura testaceous-yellow, shiny. Halteres dark brown (the knobs broken). Legs with the coxae testaceous-yellow; trochanters yellow; remainder of the legs slender but not excessively elongated, pale brown, darkening on the tarsi. Wings with a strong brownish tinge, the costal and subcostal cells and the stigma more yellowish; veins dark brown. Venation:  $Sc^2$  ending just before the fork of Rs;  $R^{2+3}$  slightly longer than the long Rs; r rather indistinct, on  $R^2$  more than its own length beyond the base;  $R^3$  about one-half longer than  $R^{2+3}$ ; petiole of cell  $M^1$  very short, a little less than r; m longer than the outer deflection of  $M^{3+4}$ ; fusion of  $M^{3+4}$  and  $Cu^1$  punctiform; cell  $Cu^1$  twice as long as wide; cell second A narrow. A fringe of rather stiff, bristle-like hairs completely surrounds the wing-margin. Abdominal segments obscure brownish-yellow; seventh and eighth segments dark brown. Hypopygium semi-inverted as in many species of this genus.

*Hab.* New South Wales: Dorriga (W. Heron). Type, L. 12183.

### **TIPULA Linnaeus, 1758.**

#### **TIPULA LEPTONEURA sp. nov.**

General colouration light brown, the thoracic pleura more yellowish; legs long and slender, claws toothed in the male; wings faintly brownish-grey, the costal and sub-costal cells more yellowish; cell  $R^2$  small, cell second A very narrow; male hypopygium fused into a continuous ring.

♂ Length, 14 mm.; wing, 15.5 mm.

Frontal prolongation of the head yellowish-brown; nasus moderately long, provided with conspicuous black and yellow setae; palpi light brown. Antennae

short, if bent backward extending about to the wing-root; scape and first flagellar segment light brown; flagellar segments indistinctly bicolorous, the basal swelling of each segment black, the remainder of each segment brown; flagellar segments slightly dilated before their tips to appear binodose; verticils long and conspicuous. Head greyish-brown; vertex strongly infuscated; a narrow pale border adjoining the eyes; a capillary brown median vitta; genae pruinose. Mesonotal praescutum and scutum light brown with indistinct stripes; scutellum and postnotum yellowish-testaceous. Pleura brownish-yellow. Halteres dark brown, the base of the stem narrowly yellowish. Legs with the coxae yellowish, very sparsely dusted with grey; trochanters yellow; femora brown, the base paler; tibiae and tarsi brown; legs long and slender, the metatarsi longer than the tibiae; claws toothed in the male. Wings faintly brownish-grey, the costal and subcostal cells and the wing-root more yellowish; stigma brown, completely filling cell  $Sc^1$ ; obliterative areas of slight extent; veins dark brown. Venation: Rs short, about equal to  $R^{2+3}$ ; cell  $R^2$  small, its inner end pointed; vein  $R^3$  straight, about one-half longer than Rs; cell first  $M^2$  comparatively small, pentagonal; petiole of cell  $M^1$  longer than m; second anal vein short and straight, cell second A being long and narrow. Wings petiolate. Abdomen yellowish basally, segments four to eight dark brown; hypopygium brownish-yellow. Male hypopygium incrassated, the sclerites fused into a continuous ring. Region of the ninth tergite tumid, the caudal margin produced caudad into two blackened, conspicuous blades that are densely set with black spicules. Pleural region slightly produced, the principal appendage a pale, flattened bifid lobe. Region of the ninth sternite carinate, the median area produced into a small, slender tubercle; dorsal caudal angles of the sternite with long, yellow hair. Eighth sternite unarmed.

*Hab.* Northern Territory: Bathurst Island, Melville Island (W. D. Dodd). Type, I. 12184.

*T. leptoneura* is a true member of the genus *Tipula*, and apparently the first to be reported from Australia. It belongs to a group or subgenus that consists of many African species (*T. alphasps* Speiser, *T. langi* Alex., *T. gaboonensis* Alex., and others), distinguished by the small size of the cell  $R^2$ , the toothed claws in the males, and the fused sclerites of the male hypopygium.

## ON AUSTRALIAN COLEOPTERA.

By ARTHUR M. LEA, F.E.S., ENTOMOLOGIST, S.A. MUSEUM.

### PART IV.

#### FAMILY CHRYSOMELIDAE.

Plate iv and Text fig. 337.

THE insects dealt with in this part are mostly fungus-frequenting species. It will be noticed that *Diphyllus* and *Diplocolus* are referred to the Erotylidae, instead of to the Mycetophagidae, the former family being now considered by many authors to be their true location.

#### **COLASPOIDES CUPREOVIRIDIS** sp. nov.

♂ Bright metallic coppery-green, under-surface less conspicuously metallic and tip of abdomen reddish; labrum, legs, antennae and palpi reddish, tips of antennae infuscated.

Head with fairly dense but irregular punctures between eyes, becoming smaller and sparser about base, and more crowded on clypeus; median line well-defined. Antennae rather long and thin, third joint no shorter than fourth. Prothorax about twice as wide as the median length, sides evenly rounded, all angles slightly armed; middle with rather small and not very dense punctures, becoming larger but not much denser on sides. Scutellum impunctate. Elytra rather short; with fairly large punctures, subgeminately arranged in parts, posteriorly confined to distinct striae, larger than elsewhere and transversely confluent behind shoulders. Apical segment of abdomen feebly transversely impressed, but in middle shallowly foveate. Legs rather short and stout; front femora acutely dentate; basal joint of front and middle tarsi dilated, of hind pair as long as the two following combined; hind tibiae longer than the others, gently emarginate on lower-surface beyond middle, and then dilated to apex. Length, 5-5.25 mm.

*Hab.* Queensland: Cairns district (F. P. Dodd). Type, I. 11998.

A bright-green species like *C. bicarinata*, *elegantula*, and *foveiventris*, but readily distinguished from these by the abdomen and hind tibiae: the latter are distinctly dilated near apex, but less suddenly and strongly than in *foveiventris*, and the abdominal fovea is shallower, with its outline less circular.

**RHYPARIDA ALLENI** Lea.

Two specimens, from Darwin, differ from the type in being smaller, 4-4.75 mm., prothorax with rather larger punctures, and the elytral ones without a water-logged appearance.

**RHYPARIDA MEDIONIGRA** Lea.

A specimen, from Cue (Western Australia), has the side of each elytron, but not the extreme margin, flavous throughout.

**RHYPARIDA CAERULEIPENNIS** Lea.

Three specimens, from Cairns, probably belong to this species, but have the legs mostly black, with a slight metallic gloss; one has the elytra purplish-blue, on the others they are brassy, with a slight greenish gloss. Two, from North-Western Australia, probably also belong to the species, their legs are mostly black; and elytra black with a slight coppery gloss. One, from Darwin, has the upper-surface bronzy with a greenish gloss, and the legs obscurely reddish; another has similar legs, but the elytra coppery-purple.

**RHYPARIDA FUNEREA** sp. nov.

. Black, legs blackish-brown, tarsi, antennae (apical joints infuscated), palpi and labrum paler.

Head shagreened and with small punctures, except on clypeus, where they are denser and larger, median line slight. Eyes large, separated slightly more than the diameter of one. Prothorax about twice as wide as long, front angles armed; punctures dense, sharply defined, and of moderate size, becoming small in middle of apex. Elytra rather short, distinctly wider than prothorax; with rows of large punctures, becoming smaller (but not very small) posteriorly, interstices with minute punctures. Flanks of prosternum distinctly striated throughout. Legs stout; femora edentate; claws bifid. Length, 4.5-5 mm.

*Hab.* Northern Territory: Darwin and Stapleton (G. F. Hill). Type, I. 11981.

A second specimen differs from the type in having the scutellum, elytra, and under-surface of the same dingy-brown colour as the legs. The type in my table of the genus<sup>(1)</sup> would be associated with *R. crassipes*, which is a considerably narrower species, with coarser punctures, eyes more distant, head and prothorax shining, etc.; the second specimen would be associated with *R. mayae*, which is a narrower species, with the head but not the prothorax shagreened.

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(1) Lea, Trans. Roy. Soc., S.Aust., 1915, p. 112.

**RHYPARIDA BIVITTIPENNIS** sp. nov.

Reddish-castaneous, legs (knees infuscated), antennae and palpi paler, elytra with a blackish vitta on each side from base to near apex.

Head convex and with minute punctures, except in front and on the clypeus, where they are fairly large and sharply defined; median line short. Eyes large and widely separated. Prothorax not twice as wide as the median length, front angles armed; punctures small and rather sparse in middle, becoming larger and denser, but somewhat irregular on sides. Elytra with rows of rather large punctures, becoming smaller posteriorly. Flanks of prosternum striated from base to apex, the striae becoming very faint near the margins. Femora stout, all distinctly dentate; claws bifid. Length, 4.5–5 mm.

*Hab.* Northern Territory: Darwin (G. F. Hill, No. 237; and W. K. Hunt).

Some of the specimens are of a brighter red than others; one is almost flavous, with the vittae reduced to rather small infuscated spots, another has the vittae shorter than usual, with the apex of elytra flavous; each vitta usually occupies about one-third of the base, but about two-thirds posteriorly, on one specimen it extends to the apex itself; parts of the under-surface are sometimes infuscated. The prothorax has some coarse, irregular punctures, but not in oblique rows as in *R. polymorpha*; passing that species in my table, it would be associated with *R. maculicollis* and *R. melvillensis*, from the former it is distinguished by its wider form, sparser and stronger prothoracic punctures and differently coloured elytra, and from the latter by its smaller size, very different colour and finer elytral punctures.

**RHYPARIDA SEMIOPACA** sp. nov.

Flavous, each elytron with a black lateral vitta.

Head opaque and with scarcely visible punctures, even on the clypeus; median line short. Eyes rather large and widely separated. Prothorax about twice as wide as long, greatest width at basal third, all angles armed; surface opaque and impunctate. Elytra with rows of not very large punctures, becoming very small posteriorly; interstices with scarcely visible punctures. Flanks of prosternum with abbreviated striae near coxae. Femora stout and rather feebly dentate; claws bifid. Length, 4 mm.

*Hab.* Northern Territory: Darwin (G. F. Hill, No. 209). Type, I. 11983.

Parts of the prosternum are very finely striated, but the striae are not continuous from base to apex; this character, and the opaque, impunctate prothorax, readily distinguish the species from the preceding one, to which, at first glance, it appears to belong. The elytral vittae are rather narrow at the base, but dilate posteriorly till they cover most of the surface; on the two specimens in



the Museum they terminate just before the apex. In my table it would be placed in I, *mm*, with *R. didyma*, which is a much larger and otherwise very different species. *R. mediovittata* has the elytral markings shorter and not touching the sides, and the prothorax bimaculate.

### **RHYPARIDA NIGRIVENTRIS sp. nov.**

Castaneo-flavous, an apical U on elytra, and abdomen black; knees, tips of tibiae, tarsi and apical two-thirds of antennae infuscated.

Head subopaque with scarcely visible punctures, except on clypeus, where there are a few distinct ones; front of clypeus conspicuously notched. Eyes rather large and widely separated. Prothorax subopaque, twice as wide as long, sides evenly rounded, all angles armed; punctures sparse and small. Elytra distinctly wider than prothorax; with rows of not very large punctures, becoming inconspicuous posteriorly. Femora stout and unarmed; claws bifid. Length, 4-4.25 mm.

*Hab.* Northern Territory: Darwin. Type, I. 11984.

The sides of the U are about half the length of the elytra, on one specimen its sides are entire, on another each side is encroached upon by the flavous portion. From some directions parts of the flanks of the prosternum appear to be very feebly striated. In my table the species would be referred to I, and from the two species placed there, *R. trimaculata* and *didyma*, it differs in being much smaller, and very differently coloured.

### **RHYPARIDA OBLIQUA sp. nov.**

Pale castaneo-flavous.

Head without punctures, except for a few minute ones at base and on clypeus; median line faint. Eyes rather large and widely separated. Prothorax at base about twice as wide as the median length, sides obliquely diminishing in width to apex, angles unarmed; impunctate or almost so. Elytra rather short; with rows of punctures of moderate size, becoming much smaller posteriorly. Femora stout, edentate; claws bifid. Length, 4.5-5 mm.

*Hab.* Northern Territory: Darwin, in January (G. F. Hill). Type, I. 11985.

The prosternum is without striae, even near the coxae; the elytral punctures are not very large, their true sizes may be noted from oblique directions, but owing to "water-logging" on several of the, six, specimens before me they appear to be very large, even near the apex. Even the tips of the antennae are not infuscated. Readily distinguished from the other pale species of the genus by the oblique sides of prothorax, each of these being quite straight from base to apex,

with the angles not projecting outwards; in my table it would be associated with *R. pallidula*, which has the sides of the prothorax rather strongly rounded, and the disc with distinct punctures.

### **EDUSA SUTURALIS** Chp.

Five females, from Kulpara (South Australia), have the elytra (except as to their clothing) entirely black.

### **EDUSA SERICEA** Lea.

A specimen, from Beverley (Western Australia), is of a beautiful golden-red, its elytra in some lights have a purplish gloss, and on each several purplish-blue lines may be seen through the pubescence.

### **EDUSA MULTICOLOR** sp. nov.

♂ Coppery-green, most of elytra golden-red or golden-purple, under-surface bronzy, tibiae, basal joints of palpi and basal half of antennae more or less reddish. Head, sides of prothorax, under-surface and legs with fairly dense, white pubescence, elytra with stouter but sparser clothing.

Head shagreened and with fairly dense punctures; median line shallow at base, fairly deep and triangularly dilated in front. Antennae rather long. Prothorax about twice as wide as long, sides evenly rounded; with fairly dense, subasperate punctures, in places transversely confluent. Scutellum with numerous punctures. Elytra with dense punctures, on basal half mostly transversely confluent. Abdomen with basal segment glabrous and finely striated in middle, fifth almost simple. Femora stout, front pair acutely dentate; basal joint of all tarsi somewhat inflated; hind tibiae dilated at apex, apical slope bisinuate, inner edge straight. Length, 5.5–7 mm.

♀ Differs in being larger and wider, much less of upper-surface green, antennae and legs shorter, abdomen with less of basal segment glabrous, and the fifth simple and less encroached upon by pygidium.

*Hab.* Victoria: Sea Lake (J. C. Goudie, No. 769). Type, I. 11987.

A beautiful species, in appearance rather close to *E. diversicollis*, but less elongate and hind tibiae of male with the inner edge straight, and scarcely different from that of the female. On the male a fairly large subtriangular space about the scutellum is green, the colour then changes, through various golden shades, till on the sides and apex it becomes a beautiful purple, the sides of the prothorax also have a purplish gloss; the female is mostly golden, on the head the only parts green are the clypeus and labrum, the scutellum and the suture for a short distance behind it are green; more of the elytra is purple than on the

male, but the purple is not so bright. On the elytra the white setae are slightly fasciculate in appearance, but they do not form true fascicles, they are absent from a fairly large subtriangular space about the base. The prothorax is very finely transversely striated, so as to appear shagreened.

**EDUSA OBSCURA sp. nov.**

Black, in parts with a rather slight metallic gloss; labrum, parts of five basal joints of antennae, parts of palpi, and bases of tibiae more or less reddish. Densely clothed with short, ashen pubescence.

Head with dense but more or less concealed punctures; median line narrow. Prothorax with punctures much as on head; front angles rather acutely armed. Elytra with crowded and rather coarse punctures, posteriorly almost confined to striae, interspaces with rather dense and small punctures. Apical segment of abdomen with a wide, shallow depression in middle. Femora stout, subangulate, but scarcely visibly dentate; basal joint of front tarsi slightly inflated. Length, 7 mm.

*Hab.* New South Wales: Blue Mountains (Dr. E. W. Ferguson). Type (unique), I. 11988.

The metasternum has a distinct purplish gloss, and parts of the upper-surface are slightly brassy or purplish. The three apical joints of antennae are missing from the type, the second joint is stouter than the third, but scarcely half its length. On each elytron two geminate rows of punctures may be traced from the base to beyond the middle, when they converge to become the striae of the apical slope, although the punctures are dense and rather coarse, especially behind the shoulders, they are nowhere distinctly confluent. The front femora from above appear to be edentate, but from below a feeble tooth may be noticed. The apical segment of the abdomen is irregularly impressed, but as the basal one is strongly convex, the sex of the type is doubtful. In my table would be associated with *E. ursula*, from which it differs in being much larger, differently coloured, prothorax with distinct punctures, and elytral punctures larger and some in geminate rows; it is closer to *E. impressiceps*, but is somewhat larger, only feebly metallic, and legs, except the extreme bases of tibiae, entirely black. It is considerably larger than all the non-metallic species.

**EDUSA CAPILLATA sp. nov.**

Black with a bronzy gloss, front of head coppery-green, labrum, antennae (upper-surface of basal joint and tips of six apical ones infuscated) and basal joints of palpi more or less flavous, or reddish. Densely clothed with ashen pubescence, mixed with longer and more or less erect hairs.

Head shagreened and without distinct punctures, except on clypeus. Antennae rather long and thin. Prothorax shagreened and with very minute punctures. Elytra with crowded punctures, but fairly large only on basal half. Abdomen glabrous along middle, apical segment shallowly depressed towards each side, and with a rather large, round fovea, in middle. Front femora stout and acutely dentate. Length, 6.25 mm.

*Hab.* New South Wales: Mittagong (Dr. E. W. Ferguson). Type (unique), I. 11989.

Parts of the under-surface have a greenish or coppery gloss. On the prothorax the pubescence is rather longer and denser on the margins than the disc; on the elytra there are quite distinct lines of pale pubescence, although not sharply defined, about nine on each elytron; the longer hairs are very conspicuous on the elytra from the sides, and are distinct, although much shorter, on the prothorax. The type is probably a male, and, in my table, would be associated with *E. aenea*, but is larger, darker, legs entirely black, elytra with denser clothing, the long hairs longer and more numerous, and scutellum not green.

### **EDUSA PUNCTIPENNIS sp. nov.**

♂ Coppery-bronze; labrum, antennae (except tips of some joints), legs (knees infuscated) and basal joints of palpi more or less reddish. Rather densely clothed with ashen or white pubescence, the elytra, in addition, with long, suberect, darker hairs.

Head and prothorax shagreened and with small punctures. Elytra with dense and rather large punctures, becoming smaller posteriorly and nowhere confluent. Abdomen with a small fovea on fifth segment. Legs stout; front femora slightly dentate; hind tibiae simple. Length, 5-5.25 mm.

♀ Differs in having abdomen more convex, nonfoveate, and antennae and legs somewhat shorter.

*Hab.* Victoria: Aspendale (Dr. E. W. Ferguson). Type, I. 11972.

The front femora are feebly dentate, but from below the tooth is sufficiently distinct. Regarding the species as belonging to D, of my table, it would be associated with *E. tridens*, to which it is certainly close, and from which it differs in being slightly smaller, the male nowhere green, rather more brassy than bronzy, similar in colour to its own female, and the elytra with coarser punctures and longer clothing. Regarding it as belonging to D D, it might be associated with *E. fraterna*, with which it agrees well in colour, except that the femora are paler, and that the elytral clothing is darker, the elytral punctures are also distinctly coarser, and those of the prothorax much finer, although fairly distinct before abrasion. In colour it is close to some specimens of *E. aenea*, but the

elytra are without defined lines of clothing, and are more coarsely sculptured; structurally it is close to *E. melanoptera*, but is conspicuously metallic, and the elytral clothing is decidedly longer.

### **GEOPTERA ARMIVENTRIS Lea.**

Two females, from Thursday Island, appear to belong to this species; they differ from the male in having somewhat shorter legs, hind tibiae without produced apical spur, and abdomen more convex and simple.

### **GEOPTERA APICILATA sp. nov.**

♂ Piceous-brown with a bronzy gloss, parts of under-surface paler; labrum, legs (knees and claws infuscated), basal third of antennae and palpi flavous.

Head with fairly dense and sharply defined punctures. Eyes rather large and prominent. Prothorax about twice as wide as long, sides almost evenly rounded, angles unarmed; punctures much as on head, but somewhat larger near hind angles than elsewhere. Elytra with dense and fairly coarse punctures, becoming confined to striae posteriorly, interspaces with minute punctures. Abdomen finely transversely strigose and with numerous subasperate punctures; fifth segment with a small, transverse, median fovea. Femora stout and edentate; hind tibiae with apical third dilated and bent outwards; basal joint of front and of middle tarsi dilated. Length, 5 mm.

*Hab.* North-western Australia: Wyndham (J. Clark from W. Crawshaw).

Type, 1. 11999.

In size and general appearance very close to *G. tuberculiventris*, but hind tibiae very different, abdomen not tuberculate and sides of prothorax different; it is still closer to *G. rhacocnema*, but the hind tibiae are shorter and somewhat wider at apex, with the whole of the dilated part bent outwards, and the basal two-thirds distinctly thinner, the fourth segment of the abdomen is slightly smaller (slightly shorter than the second and third combined) and not transversely depressed, the fifth has the lateral depressions less pronounced, and the median fovea more abrupt; the punctures of the upper-surface are also somewhat smaller and sparser. The type has three small, slightly elevated, impunctate spaces on the front of the head, but a second specimen is without such.

### **GEOPTERA VIRIDIMARGINATA sp. nov.**

♂ Black with a coppery or bronzy gloss, margins of prothorax and of elytra, and parts of under-surface dark green; labrum, tip of abdomen, and parts of legs obscurely flavous, or testaceous.

Head with dense, sharply defined punctures. Eyes large and prominent.

Prothorax scarcely twice as wide as the median length, sides evenly rounded, front angles unarmed; with dense and fairly large punctures becoming crowded on sides, interspaces with minute punctures. Scutellum impunctate. Elytra with punctures fairly large throughout and in places transversely confluent; but with an impunctate line on each from base to apex, and remnants of two others. Abdomen with fairly dense, more or less asperate punctures, in places finely strigose; apical segment with a wide median fovea, its middle rather deep. Femora stout, edentate; hind tibiae moderately long, slightly dilated to apex, inner edge straight almost throughout. Length, 7.5–8.5 mm.

♀ Differs in being more robust, prothorax more transverse, abdomen more convex and non-foveate, and legs shorter, with basal joint of front tarsi smaller.

*Hab.* Western Australia: Kellerberrin (J. Clark from W. Crawshaw). Type, I. 11967.

In my table would be associated with *G. hardcastlei*, from which the male differs in having smaller eyes, prothorax more rounded in middle, and basal segment of abdomen in parts densely and finely striated, and with more numerous punctures. The head of the male has been damaged, and its antennae and palpi are missing; on the female the antennae are of a dingy flavous, with the tips of five joints infuscated; its palpi are entirely flavous; on both specimens there is a short, impunctate, median line, near the base of the pronotum.

### **GEOPTERA SOROR sp. nov.**

♂ Black with a coppery or bronzy or coppery-green gloss; labrum, base of antennae, palpi, tip of abdomen and base of femora more or less obscurely reddish.

Head with crowded and sharply defined punctures, but in places confluent; with a vague median line. Antennae long and thin. Prothorax about once and two-thirds as wide as the median length, sides gently rounded, hind angles only armed; with crowded punctures, slightly larger than on head. Scutellum impunctate. Elytra much wider than prothorax; with crowded punctures, many of which are transversely confluent, but leaving some feebly defined impunctate lines, which posteriorly are marked off by striae. Abdomen faintly transversely striated, and with rather small punctures, apical segment with a wide impression. Femora unarmed; hind tibiae longer than the others, rather thin and curved in middle. Length, 8 mm.

*Hab.* Western Australia: Beverley (E. F. du Boulay). Type, I. 11968.

In general appearance very close to the preceding species, from which it may be distinguished by the abdominal fovea; on the present species this is fairly deep and extends as an even impression across more than one-third of the segment; on that species it is suddenly deepened in the middle, the deep part being

hardly more than one-fifth the width of the segment; on the present species also the punctures of the upper-surface are more crowded, the legs are darker, and the hind tibiae curved. In my table it would go with *G. hardcastlei*, from which it differs in the basal and apical segments of abdomen, evenly rounded sides of prothorax, smaller eyes and more crowded punctures.

**GELOPTERA APICIVENTRIS sp. nov.**

♂ Bright, metallic bluish-green, in parts with a faint coppery gloss; labrum, most of antennae, and parts of palpi and of legs more or less reddish.

Head with fairly dense and sharply defined punctures, a vague depression in middle; a small, highly polished, coppery spot near each antenna. Eyes large and rather widely separated. Antennae rather long and thin. Prothorax not twice as wide as the median length, sides almost evenly rounded, hind angles only armed; with rather large, sharply defined punctures somewhat irregular in middle, crowded on sides. Elytra with crowded and rather large punctures, a few transversely confluent before middle, posteriorly near suture confined to striae. Abdomen with basal segment depressed in middle, margins of intercoxal process narrowly elevated, fourth segment large, a wide depression on each side of middle, fifth segment foveate and red in middle, with a distinct central granule. Femora stout, front ones rather minutely dentate; hind tibiae elongate, apical fourth dilated. Length, 5-5.25 mm.

*Hab.* Northern Territory: Darwin. Type, I. 11970.

In general appearance close to *G. intercalaris*, but legs darker, front femora dentate, abdomen with the ridge on each side of intercoxal process not passing the coxa, and two apical segments different.

**ALITTUS CARINATUS Blackb.**

On the type and on several other specimens of this species, the elytra are uniformly coloured, except that on some parts the green sheen is more conspicuous than on others; but on three Darwin specimens there are three conspicuous pale lines on each elytron, the punctures between the first and second lines are in four irregular rows; on three others the pale lines are present, but more feebly defined.

**ALITTUS FLAVOLINEATUS sp. nov.**

♀ Reddish-castaneous, in parts with a coppery, or bluish, or purplish gloss; antennae, palpi, and three distinct lines on each elytron flavous. Head, prothorax, under-surface and legs with depressed, white pubescence, tips of elytra slightly pubescent.

Head with irregularly distributed punctures, sharply defined only on clypeus. Prothorax twice as wide as long, sides almost evenly rounded, angles slightly armed; with large and irregularly distributed punctures, leaving numerous small, subtubercular, impunctate elevations. Scutellum impunctate. Elytra rather wide, slightly diminishing in width from shoulders; with large, round, deep punctures, irregular about base, more or less lineate in arrangement elsewhere. Legs stout; femora edentate. Length, 8–9 mm.

*Hab.* North-western Australia: Forrest River (J. Clark from W. Crawshaw). Type, I. 11996.

Readily distinguished from all other described species, except *A. carinatus*, by the striped elytra and from the striped variety of that species by the punctures between the first and second stripes being in two rows only, and individually much larger. The sides of the prothorax at first glance appear to be quite evenly rounded, but on close examination faint indications of teeth may be traced on two, of the three, specimens before me.

#### **TOMYRIS SUBLAETA** Lea.

Four specimens, from the Blue Mountains, evidently belong to this species, but differ considerably from the types in colour; one has the head, except for a vivid green strip in front, prothorax, scutellum and elytra, of a beautiful golden-red; the others have the head, except at base, and scutellum green, with a wide median portion of the prothorax and elytra golden-red, or brassy.

#### **TOMYRIS NIGRA** sp. nov.

♀ Black, with a slight bronzy gloss, less distinct on the elytra than elsewhere, parts of four basal joints of antennae, basal joints of palpi and knees reddish. Elytra with moderately long and not very dense, suberect, white pubescence; much shorter but denser elsewhere.

Head with crowded, asperate punctures. Antennae with five apical joints stouter than usual. Prothorax with a shallow and irregular but distinct impression across middle; punctures slightly larger than on head. Elytra with large, irregular punctures, larger (especially behind shoulders) at basal third than elsewhere, but becoming rather small about apex. Length, 5.25 mm.

*Hab.* New South Wales: Blue Mountains (Dr. E. W. Ferguson). Type (unique), I. 11993.

In size and colour much like the female of *T. obscura*, but the punctures are much larger and more sharply defined, the five terminal joints of antennae are wider and the clothing is different; in my table it would go with *T. villosa*, but differs from the female of that species in being considerably larger, black with but a slight metallic gloss, and with much larger elytral punctures,



**CLEORINA PURPUREA** Lea.

On several specimens of this species the upper-surface is of a more or less brassy-green, or blue.

**MEGASCELOIDES ARROWI** sp. nov.

♂ Castaneous-brown or piceous-brown, antennae paler but some joints infuscated. Clothed with moderately long, white, depressed pubescence or setae, denser on sides of metasternum than elsewhere.

Head with dense but partially concealed punctures; with a vague median line. Antennae rather long, eleventh joint longer than tenth and acutely pointed. Prothorax not twice as wide as long, sides gently rounded, angles slightly projecting; with small and moderately dense punctures. Elytra slightly wider than widest part of prothorax, parallel-sided to near apex; with dense and rather coarse punctures, in places transversely confluent, towards apex with convex interstices between punctate striae. Apical segment of abdomen flattened in middle, with an oblique impression towards each side. Legs stout and moderately long, basal joint of front tarsi inflated, claws acutely bifid. Length, 7-8.5 mm.

♀ Differs in having somewhat shorter and stouter antennae, prothorax fully twice as wide as long, apical segment of abdomen simple, basal joint of front tarsi smaller, and claws almost simple.

*Hab.* Western Australia: Cue (H. W. Brown); Northern Territory: Tenants' Creek (J. F. Field). Type, I. 3410.

In general appearance fairly close to *M. squamosus* Baly., but the prothoracic punctures smaller, and elytra without conspicuous erect hairs. In some respects it appears close to the description of *Terillus duboulayi* Baly., but on that species the antennae are said to be "not half the length of the body" and the elytra to be "covered with white and pale fuscous scales, arranged in broad, ill-defined vittae." On six specimens of the present species the clothing is uniformly white and the antennae, even on the female, are more than half the length of the body, the legs are also darker than noted for those of *duboulayi*; from the description of *M. perplexus* Baly., it differs in being considerably larger, eyes not entire, and abdomen and legs considerably darker.

In naming this species after Mr. Gilbert J. Arrow, I would like to place on record my gratitude to him for the invariable courtesy I have received from him, in clearing up the synonymy of species whose types are in the British Museum, in answering enquiries about others, and for the examination of cotypes and other authentic specimens.

**MACRAGONUS METALLICUS** sp. nov.

Blackish or purplish, with a conspicuous coppery-green gloss; muzzle (tips of mandibles excepted), scutellum, palpi, under-surface, coxae, and femora

(except knees) red; basal joint of antennae metallic green, five following joints shining purple, the others opaque purple.

Head with sparse and small punctures; with a shallow inter-ocular, triangular depression, each angle of which is marked by a small fovea. Prothorax about twice as wide as long; each side with three large teeth: the largest one median, the next apical and about half its size, the other and smallest one basal; a fairly large fovea on each side of middle, in line with antennae; punctures somewhat larger and sparser than on head. Scutellum triangular. Elytra much wider than prothorax; each with three irregular foveae triangularly placed: the largest about two-fifths from the base and one-third from the suture, the smallest not quite half-way between it and the base, the other (a rather ill-defined one) marginal; with rows of rather distantly placed punctures, fairly large at the base, almost disappearing posteriorly. Length, 11.5–12 mm.

*Hab.* Australia (Blackburn's collection); Queensland: Kuranda (G. E. Bryant). Type, I. 4181.

From some directions the whole upper-surface appears dark metallic-green, from others metallic-purple, except that some of the punctures appear as glittering green spots. On the type some of the under-parts of the tibiae are obscurely reddish. The specimen from Kuranda (returned to Mr. Bryant) has the head red to the base, the extreme base of elytra obscurely diluted with red, the knees not green, and most of the tibiae reddish; the punctures on its head are larger than on the type, its inter-ocular depression is deeper, but its hind angle not foveate, punctures on prothorax larger, less sparse, and somewhat crowded on the largest tooth on each side, the elytral punctures are also larger. I believe the differences to be individual, rather than sexual, and that each is a male.

### **MACROGONUS MACULATUS sp. nov.**

Plate iv, fig. 1.

♂ Metallic purplish-blue; a large spot at base of head, pronotum (except for a large medio-basal spot), prosternum, and parts of mesosternum and of metasternum blood-red; elytra flavous, a short portion of suture, a small space on each side of scutellum, and ten isolated spots purplish-blue; parts of muzzle reddish, five basal joints of antennae shining, the others opaque.

Head with punctures of irregular size and irregularly distributed; a deep median line, from summit of clypeus, halfway to base. Prothorax gently and almost evenly convex, not much wider than long, each side with a large and fairly acute tooth in middle, each angle with a smaller tooth, middle of apex conspicuously incurved; punctures sparse and small. Elytra much wider than base of

prothorax; with rather small punctures, more or less seriate in arrangement. Length, 11·5–13·5 mm.

♀ Differs in having the prothorax much smaller, the sides evenly and rather gently rounded in middle, front angles concealed from above, each side of disc with a small fovea, apical incurvature wider and less pronounced, abdomen more convex, and legs and antennae somewhat shorter and thinner.

*Hab.* Queensland: Cairns district (F. P. Dodd and G. E. Bryant). Type, I. 4773.

Readily distinguished from all other described species of the genus by the spotted elytra, the spots on each are: one on the shoulder, a small one (marking the position of a shallow fovea) on the side near the base, one level with it but near the suture, a central one slightly beyond the middle, and one halfway between it and the apex. The sexual differences of the prothorax are very striking; on the female (returned to Mr. Bryant) the postmedian spot on each elytron is about twice the size of the subapical one, the latter being halfway between the suture and side; on the male the subapical one is larger than the postmedian one, and almost touches the margin.

#### FAMILY EROTÝLIDAE.

#### **EPISCAPHUIA DUPLOPUNCTATA Blackb.**

*E. nigrofasciata*, Blackb., var.

*E. subapicalis* Lea, var.

The type of *E. duplopunctata* appears to be a rather rare form of the species, subsequently named *E. nigrofasciata*. Its prothorax is without larger punctures along the median third, the punctures in the elytral series are slightly larger than usual, the smaller ones on the interstices are more numerous and slightly more conspicuous than usual. Some specimens from Queensland, including a cotype of *E. nigrofasciata*, have identical markings, and of these some have elytral punctures exactly the same, and others have the prothoracic ones similar. It occurs in Northern Territory, Queensland, and New South Wales. A specimen, from Sydney, as small as the type (Queensland specimens are usually slightly larger) has prothoracic punctures exactly the same, but on the elytral interstices the punctures are very minute. The species is also extremely close to some of the forms of *E. australis*, and I am doubtful as to whether it should not be regarded as a form of that species.

The form I named *E. subapicalis* as a variety of *E. termitophila* (*termitophila* itself, however, is distinct by its more dilated middle parts, and elytra with only two series of red markings, instead of three) appears also to belong to the species,

but has the black basal fascia of the elytra continuous, instead of twice interrupted to the base itself; it appears to be the commonest form of the species, and extends from Cairns, in Queensland, to Derby, in North-Western Australia.

**var. OBSCURICOLLIS var. nov.**

Ten specimens from Queensland (Cooktown, Cairns, Bowen, and Gayndah) and one from New South Wales (Dorrigo) may be considered as representing another variety, having the dark prothoracic blotch ill-defined, and extended so as to cover the whole surface except a narrow space at the apex, or an obscure space in each front angle; each elytron has three reddish transverse spots or fasciae: one subbasal, with a short medio-frontal extension, one postmedian, its concave side towards the apex, the other and smaller one subapical. The punctures on the prothorax and elytra are variable; to the naked eye the prothorax at a glance appears entirely dark.

**EPISCAPHULA GUTTATIPENNIS Blackb.**

This species is structurally close to *E. duplopunctata*, but is slightly more parallel-sided and with somewhat longer antennae; the type, and a specimen from Townsville, have identical pale elytral markings, which may be regarded as a subbasal fascia broken up into four spots, a postmedian fascia, also broken up into four spots, and a subapical fascia interrupted at the suture; a somewhat larger specimen, from Townsville, has smaller punctures and the postmedian fascia only broken up into two spots.

**EPISCAPHULA FOVEICOLLIS Blackb.**

On three specimens with the typical markings of this species (a cotype and others from Charters Towers and Normanton), there are large punctures congested into spaces on each side of the prothorax near the base and apex; on the apical spaces the surface is flattened in two specimens, and very feebly depressed on the other. A specimen, from the Stewart River, that appears to belong to the species, has no medio-lateral spots on the prothorax, the medio-basal one is distinctly bifid in front, the larger punctures are more generally distributed, although fairly dense in the angles; on the elytra the subapical spots are conjoined to form a fascia continuous from side to side.

**EPISCAPHULA NIGRONOTATA sp. nov.**

Plate iv, fig. 2.

Black; prothorax flavous, a large black spot on each side of the middle, the two conjoined at base; elytra flavous, a large black spot about scutellum conjoined

to a larger median spot; a spot on each shoulder, one on each side about the middle, and one about the apical third; the part beyond the latter castaneo-flavous; sides of prosternum and two apical segments of abdomen flavous; parts of legs obscurely diluted with red.

Head with fairly dense and small, but sharply defined, punctures, becoming larger about base. Antennae with third joint fully twice as long as fourth. Prothorax about twice as wide as the median length, sides oblique to near apex, front angles produced and acute; with small and fairly dense punctures, a few of larger size in a shallow depression each side of base. Elytra diminishing in width from near base; with small and fairly sharply defined punctures. Coxal lines of abdomen short but fairly distinct. Length, 8–10 mm.

*Hab.* Queensland: Cairns district (A. M. Lea). Type, I. 11772.

A beautiful species with colours somewhat as on fresh specimens of *E. pictipennis*, but the pattern is not the same, the width across the middle is greater, the series of punctures on the elytra are smaller, etc. One of the four specimens has a small pale spot on the forehead, on another the three median spots of the elytra are combined to form an irregular fascia; on all of them the tips of the elytra are of a more reddish colour than the other pale parts. The elytral punctures are all really small, but owing to "waterlogging" there appear to be rows of quite large ones on the paler parts, but from the sides their true sizes are evident.

### **EPISCAPHULA ATROMACULATA sp. nov.**

Plate iv, fig 3.

Black; prothorax flavous, a large round black spot on each side of middle; elytra flavous, tips pale castaneous, a large almost square spot about scutellum, a rounded one on suture before middle, and three isolated ones on each elytron: an oblique one commencing on the base near the shoulder and extending to level with middle of round sutural spot, a triangular one with its most acute angle directed to the hind end of the sutural spot, and an irregularly shaped one with an extension almost connecting it with the suture one-fifth from apex; epipleurae black; front and sides of prosternum and two apical segments of abdomen flavous; parts of legs obscurely reddish.

Head with dense, sharply defined punctures of moderate size. Third joint of antennae twice the length of fourth. Prothorax about once and one-half as wide as long, sides oblique to near apex, where the angles are produced and somewhat acute, hind angles slightly rounded off; punctures much as on head, but rather less dense, a few of larger size in a small depression each side of base. Scutellum twice as wide as long. Elytra narrow; with small but sharply defined punctures. Coxal lines of abdomen inconspicuous. Length, 10.25–11 mm.

*Hab.* Queensland: Kuranda (H. J. Carter from F. P. Dodd); Innisfail (National Museum from C. French). Type, 1. 12004.

A very distinct species. There is a small spot on each side of the elytron near the end of the black epipleurae and invisible from above, on the type it is hardly more than a stain, but on the cotype it is larger and more distinct. On the elytra there are rows of small punctures, hardly larger than those on the interstices, but owing to "waterlogging" they appear, from directly above, to be much larger.

### **THALLIS VINULA Er.**

*T. subvinula* Blackb., var.

Plate iv, fig. 4.

The form described by Blackburn as *T. subvinula* can only be regarded as a slight variety of *T. vinula*, with the elytral markings somewhat smaller than usual. Slight differences in the punctures may be seen on many specimens with markings of normal size. The typical form occurs in New South Wales, Victoria, and South Australia, as well as in Tasmania. Some of the New South Wales specimens in the Museum were taken from *Polyporus salignus*.

The species also occurs in Western Australia, where the typical form is rare and the variety *subvinula* fairly common; of twenty-four specimens from Western Australia hardly two are exactly alike in size (4.5–6.5 mm.), colour and markings; the punctures, as a rule, are decidedly stronger than on specimens from Eastern Australia; the prothorax varies from dingy-brown to deep-black, the elytra are occasionally entirely dark, but usually have four flavous spots: of these the two at the basal third vary considerably in size, and occasionally are conjoined to form an irregular fascia, or they may be so small and obscure as to be traceable with difficulty; the two postmedian ones are seldom large, and are often hardly traceable.

### **var. OCCIDENTALIS var. nov.**

Six specimens have the upper-surface black, except for two flavous spots, of variable size, at the basal third of the elytra.

*Hab.* Western Australia: Swan River (J. Clark and A. M. Lea).

### **THALLIS BIFASCIATA Crotch.**

A specimen from Sydney (the type was from Rockhampton) agrees with the description of this species.

Var.? A specimen, from Lucindale, possibly also belongs to the species, but differs from the Sydney one in being somewhat smaller and narrower, antennae

somewhat shorter, with the third and fourth joints equal, the black spot about the scutellum is semicircular instead of quadrate, and the red tips of the elytra are much less pronounced.

**THALLIS ERICHSONI** Crotch.

A specimen from Sydney, the original locality, and three from South Australia, appear to belong to this species; two from the latter State (standing as *T. erichsoni* in the Blackburn collection) have the pronotum entirely black, except that along the middle the derm is obscurely diluted with red, but on the other from South Australia, and on the one from Sydney, the red is more conspicuous, so that the pronotum might be regarded as of a dingy red, with the sides widely infuscated. The elytral markings, however, appear to be constant.

**THALLIS FEMORALIS** Blackb.

This species varies considerably in size and in the intensity of its markings; it is fairly common in Tasmania, to which State it appears to be confined.

**THALLIS JANTHINA** Er.

This species occurs in abundance in many kinds of fungi, including *Polyporus salignus*, in New South Wales, Victoria, Tasmania, and South Australia.

**THALLIS COMPTA** Er.

*Hab.* Victoria, Tasmania, South Australia.

**THALLIS DENTIPES** Blackb.

*Hab.* New South Wales, Victoria, Tasmania, South Australia.

**THALLIS VENUSTULA** Blackb.

*Hab.* New South Wales: Forest Reefs, Dorrigo, Clarence River.

**THALLIS ALTERNATA** sp. nov.

Plate iv, fig. 5.

Black; three fasciae on elytra, metasternum, abdomen, and tarsi reddish, some other parts of legs and palpi obscurely reddish. Densely clothed with dark pubescence, becoming pale on the pale parts; in addition with numerous, suberect hairs.

Head with dense and (where not concealed by pubescence) sharply defined punctures. Antennae rather short, third joint slightly longer than fourth. Prothorax almost twice as wide as long, sides slightly uneven; punctures much as in head. Elytra no wider than widest part of prothorax, parallel-sided to near

apex; with regular rows of fairly large punctures, the interstices with numerous small ones. Prosternum with rather coarse punctures on sides, smaller ones in middle; intercoxal process small. Coxal lines of abdomen inconspicuous. Length, 4–5 mm.

*Hab.* New South Wales: Ropes Creek (Dr. E. W. Ferguson), Sydney (Blackburn's collection), Windsor (A. M. Lea), Dorrigo (W. Heron); Northern Territory: Daly River (H. Wesselman), Melville Island (G. F. Hill, No. 3461). Type, I. 12008.

Allied to *E. erichsoni* and *E. australiae*, but with very different elytral markings; these, from directly above, appear to be in alternating red and black bands; of the red ones the first occupies the basal two-fifths, except for a large spot (varying from semicircular to transversely oblong) about the scutellum, and a narrow space (invisible from above) on each side, it usually has a short extension on the suture; the second is median, somewhat oblique, rather narrow, and extends neither to suture nor sides; the third is at the apical fourth, slightly longer than the second, is usually, but not always, interrupted at the suture, and terminates before the sides; the scutellum is usually obscurely diluted with red. The Daly River specimen has the middle of the apex of prothorax obscurely reddish, and the red still more obscurely traceable along the middle to base.

### THALLIS SUBTUBERCULATA sp. nov.

Plate iv, fig. 6.

Black; sides of prothorax, elytra (four black spots excepted), most of abdomen, tarsi, middle coxae and palpi more or less red. Moderately densely clothed with rusty-red pubescence.

Head with sharply defined punctures of moderate size. Antennae with third joint about once and one-half the length of fourth, joints of the club not twice the width of the others. Prothorax about twice as wide as its shortest length, sides obtusely serrated, apex truncated in middle and notched near each side, the commencement of each notch marked by a slight tubercular swelling; punctures more irregular than on head, and leaving a shining median line. Elytra parallel-sided to near apex; with regular rows of fairly large punctures, becoming smaller posteriorly, the interstices each with a row of small ones. Intercoxal process of prosternum rather wide, posterior end obtuse. Coxal lines of abdomen traceable to beyond middle of first segment. Length, 5.5–6.5 mm.

*Hab.* Victoria: Warburton (H. J. Carter and J. A. Kershaw), Warragul (J. C. Goudie). Type, I. 12007.

A hairy species allied to *T. insueta*, *T. erichsoni*, *T. australiae*, and *T. alternata*, but elytra with four black spots, and the prothorax with a feeble tubercle



on each side of middle of apex; the spots on the elytra consist of a semicircular to transversely-oblong one about the scutellum, a small one on the suture near apex, and a larger, rounded, completely isolated one, on the middle of each elytron; on two of the specimens the black portion of the pronotum is entire, but on two others the middle of its apical half is red.

**THALLIS HOPLOSTETHA** sp. nov.

Plate iv, fig. 7.

♂ Black, two elytral vittae, abdomen, legs, antennae and palpi more or less flavous, rest of under-surface more or less obscurely diluted with red. Rather densely clothed with pale, rusty pubescence.

Head strongly convex and with a stridulating file on forehead; with fairly dense but irregular punctures elsewhere. Antennae with third joint slightly larger than the adjacent ones; club rather small. Prothorax scarcely one-fourth wider than median length, apex widely produced and overhanging head, notched near each side, sides gently and evenly rounded, a narrowly impressed line almost on each margin; with dense punctures, but leaving a shining median line on basal half; produced portion of apex densely granulate. Elytra scarcely wider than prothorax, parallel-sided to near apex; punctate-striate, striae distinct throughout, interstices with rather coarse punctures, becoming smaller and denser posteriorly. Prosternum with a large hairy cavity in middle of apex, an acute process overhanging the cavity; intercoxal process not very wide, its hind end obtuse. Abdomen with coxal lines distinct to near apex of basal segment. Femora stout, grooved along under-surface, the ridge on each side of the groove finely serrated; tibiae widely dilated to apex. Length, 8-9 mm.

♀ Differs in having the head smaller, forehead not separately convex, without a stridulating file, prothorax shorter, the apex less overhanging the head, with asperate punctures instead of granules, the prosternum unarmed, and without a medial-apical cavity.

*Hab.* New South Wales: Galston (D. Dumbrell), Sydney (A. M. Lea). Type, I. 12010.

The conspicuously armed prosternum, stridulating file on head, and longitudinal markings of elytra readily distinguish this species from all other named Australian Erotylidae. In the female the prosternum is unarmed, and its hind parts are exactly as in *T. insueta*. The file consists of about fifteen transverse ridges, becoming smaller in front; they are often almost or quite concealed by the overlapping prothorax. On several specimens, especially females, the darker parts are more or less chocolate-brown; each elytral vitta commences on the shoulder, is rather suddenly inflated inwards so as to occupy about six interstices,

and is then narrowed to occupy about two or three to near the apex, which it does not reach.

**THALLIS FERRUGINEA** sp. nov.

Ferruginous, legs of a somewhat brighter colour. Densely clothed with short, rusty or ashen pubescence, mixed with longer hairs.

Head with crowded punctures partially concealed by clothing. Antennae short, third joint slightly longer than the adjacent ones; club rather small. Prothorax as long as wide, apex truncated almost throughout, each marginal line invisible from above except at ends; punctures as on head. Elytra slightly more than twice the length of prothorax and scarcely wider, sides feebly rounded; with regular rows of punctures, in shallow striae, interstices with dense and small punctures. Prosternum with intercoxal process rather narrow. Abdomen with coxal lines distinct to about one-third from apex of basal segment. Legs rather short and stout; middle and hind tibiae denticulate on lower-surface. Length, 5 mm.

*Hab.* Western Australia: Cue (H. W. Brown). Type, I. 11776.

A dingy species, nearer *T. basipennis* than any other named one of the genus, but considerably narrower, with different elytral clothing.

**THALLIS SERRATIPES** sp. nov.

Of a dingy reddish-brown or castaneous: most of head black, elytra flavous, with black markings.

Head with numerous, but not crowded, sharply defined punctures. Antennae moderately long, third joint about one-fourth longer than the adjacent ones, ninth and tenth each twice as wide as long, eleventh longer than wide. Apical joint of each palpus subconical. Prothorax about once and one-half as wide as long, apex truncated across middle and obtusely notched near each side, sides feebly rounded, lateral and basal gutters distinct; punctures much as on head. Elytra distinctly wider than prothorax, parallel-sided to near apex; with regular rows of rather large punctures, in shallow striae, interstices almost or quite impunctate. Middle portion of prosternum with dense and more or less confluent punctures, the sides with sparse and larger ones; intercoxal process narrow, obtusely rounded posteriorly. Coxal lines of abdomen scarcely traceable beyond coxae. Legs long; front femora narrowly ridged on under-surface, the ridge finely serrated and terminating in a sharp but rather small tooth. Length, 6.25–8 mm.

*Hab.* New South Wales: Macquarie Pass, on *Polyporus salignus* (Dr. J. B. Cleland); Victoria: Alps (National Museum from C. French). Type, I. 11775.

An elongate species, with longer antennae and legs than usual. The upper

surface is glabrous, except for scarcely visible remnants of pubescence on the apical sides of elytra. On several specimens the antennae are almost black, and several have the sides of prothorax paler than the disc. On the elytra the black markings consist of a large blotch about the scutellum, a spot on each shoulder, a wide median irregular fascia (usually narrowly interrupted at the suture), and the apical third, the anterior portion of the latter appearing as three triangles, of which the sutural one is the widest; on several specimens parts of the dark markings are obscurely diluted with red; on one they are all connected: the median fascia, for the width of two interstices on each side of the suture, with the basal blotch, and narrowly on each side of, but not actually on, the suture with the apical marking; and also narrowly on the margins with the humeral spots; on most specimens, however, all the flavous parts of the elytra are more or less narrowly connected. Owing to "waterlogging" the seriate punctures on the pale parts of the elytra, from directly above, appear to be much larger than they really are, but when viewed obliquely they are seen to be no larger than the adjacent ones on the dark parts.

**THALLIS METASTERNAIS sp. nov.**

Plate iv, fig. 8.

Dull reddish-brown; most of head and part of antennae blackish; prothorax blackish, an obscure reddish vitta on each side; elytra black, with flavous-red markings; a fascia at basal third, narrowly connected along middle of each elytron with the base, so as to isolate a large blotch about the scutellum, an irregular post-median fascia, not quite touching suture or sides, and a large spot on each side of apex. Upper-surface with extremely short and sparse (scarcely visible) pubescence.

Head with sharply defined and numerous but not crowded punctures. Antennae with third joint slightly longer than adjacent ones, ninth and tenth each almost twice as wide as long, eleventh slightly longer than wide. Apical joint of each palpus subconical. Prothorax near apex almost twice as wide as the median length, an obtuse notch near each side of apex, sides decreasing in width from near apex to base, and very feebly irregular, lateral and basal gutters well defined; punctures slightly larger than on head. Elytra parallel-sided to near apex; with regular rows of fairly large punctures, becoming smaller posteriorly; interstices with sparse and minute punctures. Intercostal process of prosternum not very wide, obtusely pointed at end. Metasternum with large and sparse punctures on sides. Abdomen with coxal lines traceable to apex of basal segment. Front femora feebly ridged along under-surface, the ridge terminating in a feeble tooth. Length, 5 mm.

*Hab.* New South Wales: Sydney (Dr. E. W. Ferguson). Type (unique), I. 12005.

About the size of *T. macleayi*, and with somewhat similar markings, except that each shoulder is black, but the lateral gutters of the prothorax are much nearer the margins. The pubescence is almost invisible from above, and even from the sides could be easily overlooked.

**THALLIS TRICOLOR** sp. nov.

Plate iv, fig. 9.

Black; an orange-yellow spot on forehead, prothorax orange-yellow, a large subovate spot on each side of middle, touching the base at its narrower end; elytra flavous with black markings, the tips orange-yellow; prosternum (except for some infuscations about coxae) and two apical segments orange-yellow, the three basal segments more or less infuscated or black. Upper-surface glabrous.

Head with not very dense and rather small but sharply defined punctures, becoming dense on clypeus. Antennae with third joint about once and one-half the length of the adjacent ones, ninth and tenth each at apex twice as wide as the median length, eleventh about as long as wide. Apical joint of each palpus subconical. Prothorax not twice as wide as long, widest close to apex, obtusely notched on each side of apex, lateral striae extremely close to margins; punctures small and not very dense, but mostly sharply defined. Elytra distinctly wider than prothorax, parallel-sided to near apex; with regular rows of punctures of moderate size, becoming small posteriorly; interstices with scarcely visible punctures. Prosternum in parts impunctate; intercoxal process rather narrow, produced to an obtuse point posteriorly. Coxal lines of abdomen not distinct beyond middle of the basal segment. Front femora ridged on under-surface and dentate in male, simple in female. Length, 6–7 mm.

*Hab.* New South Wales: Dorrigo (H. J. Carter, W. Heron, and R. J. Tillyard). Type, I. 11773.

An elongate, beautiful species, with the three colours of *Episcaphula pictipennis* and *E. nigronotata*, but with the palpi and prosternum of a *Thallis*. On several specimens the legs (except for the claws), antennae, and scutellum are entirely deep black, but on others they are more or less reddish in parts; the black parts of the elytra are the margins and epipleurae (except about apex), a large spot about scutellum, and a spot on each shoulder, a submedian fascia (usually narrowly interrupted at the suture), and three spots (sometimes connected) at the apical third; of these the median spot is larger than the others, and has a fairly wide sutural extension almost to the apex. On several specimens parts of the head are obliquely strigose, or with punctures exhibiting a tendency to become confluent.

**HOPLEPISCAPHA gen. nov.**

Head subtriangular. Eyes small, lateral, coarsely faceted. Palpi short, apical joint conical. Antennae elongate, three apical joints forming a loose club. Prothorax rather long, sides and base finely margined. Scutellum widely transverse. Elytra elongate, parallel-sided to near apex. Prosternum evenly convex in front, process rather wide between coxae and dilated at its end; coxal cavities closed. Metasternum elongate, episterna narrow, epimera almost entirely concealed. Legs long; front femora of male dentate; tarsi linear, three basal joints setose, fourth appearing as a small basal portion of claw joint, this almost as long as the rest combined.

The elongate antennae, with club loosely articulated and hardly more than continuous with the preceding joints, is at variance with all other described Australian Erotylidae, and with all those figured by Kuhnt <sup>(2)</sup>; but the tarsi are much as figured for *Coptengis sheppardi*.<sup>(3)</sup> When the abdomen has been wetted the coxal lines are faintly traceable almost to the apex of the basal segment, but they disappear when dry. For the present the genus may be referred to the vicinity of *Episcaphula*.

**HOPLEPISCAPHA LONGICORNIS sp. nov.**

Fig. 337.

♂ Castaneo-flavous, legs flavous, knees somewhat infuscated; basal half of head, a large spot on each side of prothorax, and most of elytra, black or blackish. Upper-surface glabrous, parts of under-surface sparsely clothed.

Head with dense and sharply defined, but not very large punctures, a shallow depression at each side of clypeal suture. Antennae passing middle coxae, first joint stout, third almost twice as long as second, and about one-third longer than fourth, the others to eighth gradually decreasing in length, ninth and tenth slightly wider than eighth, and each shorter than eleventh. Prothorax slightly longer than wide, each side of apex obtusely notched behind the eye, base and sides narrowly margined; punctures much as on head, except that they are not quite as dense. Scutellum with distinct punctures. Elytra no wider than widest part of prothorax; with rows of rather large punctures, becoming smaller posteriorly; interstices with sparse and small punctures. Prosternum with dense and rather small punctures, more or less transversely confluent, the flanks with larger, round, non-confluent ones. Metasternum and abdomen with small punctures, becoming larger on sides. Front femora ridged along middle, the ridge

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(2) Kuhnt, in Wytsman's Genera Insectorum, Fasc. 88.

(3) L.c., pl. iv, fig. 7c.

ending in a strong tooth; front tibiae more strongly arched at base, and stouter at apex than the others. Length, 6–6.5 mm.

♀ Differs in the head being smaller, with shorter antennae, prothorax shorter, somewhat transverse, and slightly narrower than elytra, front legs with unarmed femora and tibiae thinner.

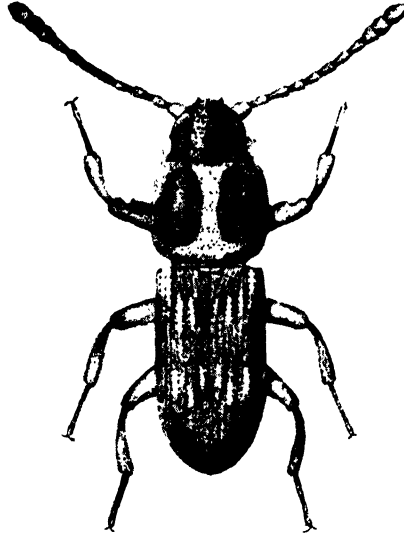


Fig. 337. *Hoplepiscapha longicornis*. Lea.

*Hab.* Western Australia: Geraldton (J. Clark), Mount Barker (A. M. Lea). Type, I. 12014.

The spot on each side of the prothorax is elliptic in shape and extends almost the length of the segment; the pale parts of the elytra are the base and apex narrowly; suture, shoulders, a series of from four to eight narrow spots at the basal fourth, the lateral ones sometimes connected with the humeral ones, and another series, of from six to twelve, beyond the middle. On one male the dark parts of the elytra are hardly more than castaneous, and the dark parts of the prothorax and head not much darker.

### **TRITOMA AUSTRALIAE sp. nov.**

Blackish or blackish-brown, elytra coppery or coppery-green, or blue; head, palpi, six basal joints of antennae, prosternum, abdomen and legs flavous, or castaneo-flavous, apical and lateral margins of prothorax and sides of metasternum more or less obscurely diluted with red. Under-surface and legs finely pubescent, upper-surface glabrous.

Head wide and almost flat; with fairly dense and sharply defined, but rather small punctures, becoming sparser towards base. Eyes lateral and rather small. Antennae scarcely passing base of prothorax, third joint about as long as first and second combined, or fourth to sixth combined, ninth and tenth each about twice as wide as long, apex incurved to middle, eleventh slightly longer than tenth, its apex rounded. Prothorax at base about thrice as wide as the median length, base bisinuate, much wider than apex, front angles produced and acute, hind ones rectangular, sides narrowly margined; punctures small and rather sparse. Scutellum wide, almost impunctate. Elytra closely applied to and with outlines continuous with those of prothorax, widest at about basal fourth; with regular rows of rather small but sharply defined punctures; interstices wide, not separately convex, with minute and sparse punctures. Intercostal process of prosternum subconical in front, wide and almost truncate at base. Abdomen with coxal lines distinct and almost enclosing a plate on each side. Legs rather short and stout; femora feebly grooved along under-surface. Length, 3.25-5 mm.

*Hab.* Northern Queensland (Blackburn's collection), Cooktown (H. J. Carter from H. W. Cox), Babinda (Dr. J. F. Illingworth), Kuranda (F. P. Dodd). Type, I. 11786.

Judged by colour alone the antennae would appear to have a five-jointed club, as the five apical joints are black, but the seventh is much the same shape as the sixth, although a trifle wider, the eighth is much smaller than the ninth, but as it is much wider than long, with its outer angles triangular, it might fairly be regarded as belonging to the club, and the latter in consequence to be four-jointed. Chapuis notes the club of *Tritoma* as three-jointed, and in English specimens of *T. bipustulata* it is conspicuously so, but as, in most details, including the finely faceted eyes, the present species agrees with the characters of that genus, it has been referred to it. It is a briefly elliptic, moderately convex species, and of six specimens no two have the elytra of the same shade of colour, although metallic in all; the specimen, from the Blackburn collection, is slightly narrower than the others, its pronotum is entirely dark, but with a slight greenish gloss, the elytra are purple, and the legs (except the tarsi, knees and trochanters) are blackish.

### **EUXESTUS TASMANIAE** Lea (formerly **TRITOMIDEA**).

Numerous specimens from Victoria (Dividing Range and Mount Hotham), and New South Wales (Glen Innes), appear to belong to this species, but differ from the types in being slightly smaller and with the head and prothorax almost entirely black or blackish.

Mr. Arrow has stated that *Tritomidea* is a synonym of *Euxestus*.<sup>(4)</sup>

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(4) Arrow, Ann. Mag. Nat. Hist., November, 1917.

**EUXESTUS MEDIONIGER** sp. nov.

Black; head, a fascia at base of elytra, their apical third and under-surface more or less castaneous; elytral epipleurae, legs, antennae, and palpi paler.

Head with minute punctures, a small fovea on each side of clypeus. Antennae short, basal joint large; club slightly wider than long. Prothorax at base almost thrice as wide as the median length, apex almost truncate, sides very finely margined; punctures sparse and inconspicuous. Elytra with outlines continuous with those of prothorax, widest at about basal fourth; punctures fairly distinct near base, sparse and inconspicuous elsewhere. Abdomen with coxal lines enclosing a distinct plate on each side. Length, 2.25 mm.

*Hab.* New South Wales: Dorrigo (W. Heron); Western Australia: Manjimup (Dr. E. W. Ferguson). Type, I. 11783.

This species, of which there are five specimens under examination, appears almost to connect the described variety of *E. ventralis* with *T. bivulneratus*; from the former it is distinguished by the more conspicuous markings at base of elytra, much finer punctures and almost truncated apex of prothorax, and from the latter by its somewhat narrower and less convex form, basal markings somewhat larger, not blood-red, and almost touching the suture, and apex of elytra conspicuously reddish.

**DIPHYLLUS OBSCURONOTATUS** sp. nov.

Black, elytra with two feebly defined spots before the middle; legs, antennae and palpi obscurely reddish. Densely clothed with short, suberect pubescence.

Head with small and dense but sharply defined punctures. Antennae just passing base of prothorax; club two-jointed. Prothorax more than thrice as wide as long, a deep stria near each side, and a much less distinct one near it. Elytra with regular rows of rather large punctures, becoming smaller posteriorly; interstices without distinct punctures. Length, 2 mm.

*Hab.* Queensland: Cairns district (A. M. Lea). Type (unique), I. 11789.

Structurally close to *D. flavonotatus*, but elytral markings consisting of two vague spots that could be easily overlooked, each is narrow and extends across three interstices; it is shorter and darker than the British *D. lunatus*, but with markings approaching those of that species.

**DIPLOCOELUS PILINOTATUS** sp. nov.

Black, legs, antennae and palpi obscurely reddish. Densely clothed with golden-grey pubescence, in places blackish; in addition with lines of short setae.

Head with dense, partially concealed punctures. Antennae short; club three-jointed, apical joint slightly longer and distinctly paler than the preceding



ones. Prothorax about twice as wide as the median length, sides gently rounded, front angles feebly produced; striae not sharply defined; punctures much as on head, but more distinct on sides. Elytral parallel-sided to near apex; with regular rows of distinct punctures, becoming smaller towards suture; interstices with minute punctures. Length, 2.25 mm.

*Hab.* Queensland: Cairns district (A. M. Lea). Type (unique), I. 11790.

On the elytra there appear to be three series of black markings, owing to the pubescence there being similar to the derm on which it rests: a spot on each shoulder, a median fascia, and a subapical interrupted one; on the prothorax there are also obscure markings; but it is probable that on rubbed specimens the markings would disappear or become inconspicuous. Seen from the front, the prothorax appears to have ten longitudinal lines of pubescence, but these decrease in number when viewed from behind.

#### **DIPLOCOELUS DECEMLINEATUS sp. nov.**

Dull reddish-brown or castaneous, legs, antennae and palpi somewhat paler. Rather densely clothed with depressed, greyish pubescence, denser and paler on under-surface than on upper; the latter, in addition, with fairly dense, suberect setae

Head with dense, partially concealed punctures. Antennae short; club three-jointed. Prothorax almost thrice as wide as long, sides gently rounded, front angles scarcely produced; with ten slight longitudinal elevations, alternating with slight depressions; punctures much as on head. Elytra at base the width of prothorax, slightly wider to about the middle, with rows of moderately large punctures, interstices with rather dense and small ones. Length, 3-3.5 mm.

*Hab.* South Australia: Lucindale (B. A. Feuerheerdt), Port Lincoln (A. M. Lea); Tasmania: Ulverstone, Hobart (A. M. Lea). Type, I. 12016.

Excluding the margins, the prothorax appears to have ten slightly elevated lines, marking off depressions, including a fairly distinct median one, the depressions on each side of the latter interrupted in the middle.

#### **DIPLOCOELUS PLATYSOMUS sp. nov.**

Blackish or blackish-brown, elytra somewhat paler but very obscure, legs, antennae and palpi castaneous. Moderately clothed with short, depressed, pale pubescence.

Head wide; with dense and small but rather sharply defined punctures; a shallow depression towards each side of clypeal suture. Eyes small, lateral, coarsely faceted. Antennae short, club two-jointed. Prothorax not twice as wide as long, widest and straight at apex, hind angles rounded off; with small and

fairly dense punctures, becoming crowded on sides. Elytra parallel-sided to near apex; with rows of fairly large punctures, becoming smaller towards suture and posteriorly; interstices with small punctures. Length, 2 mm.

*Hab.* Lord Howe Island (A. M. Lea). Type, I. 12023.

The impressed lines towards each side of the prothorax that, in addition to the marginal ones, are so conspicuous on most species of *Diplocoelus*, are represented on the present species by a submarginal one that can be seen, from certain directions, near the apex only; the transverse line near the base of the head that (when not concealed by the prothorax) is also usually very distinct, is represented by a shallow indistinct one; nevertheless the species appears to be a true *Diplocoelus*, and to be allied to *D. angustulus* and *D. apicicollis*, but it is shorter, much wider, flatter, and darker, with smaller punctures, etc. Of seven specimens obtained on the island only one has the prothorax no darker than the elytra.

## FAMILY ENDOMYCHIDAE.

### **STENOTARSUS QUINARIUS** sp. nov.

Reddish-flavous, an irregular mark on prothorax, scutellum, four spots on elytra and antennae (basal joints excepted) black. Rather densely clothed with pale, semiupright hair.

Head with minute punctures. Antennae rather short, club stout. Prothorax widely transverse, sides rather strongly rounded, apex much narrower than base and semicircularly emarginate, sublateral striae deep, dilated at base; punctures small but rather sharply defined. Elytra with sides gently rounded; with regular series of fairly large punctures, becoming smaller posteriorly; interstices with small punctures. Length, 4 mm.

*Hab.* Queensland: Mount Tambourine (A. M. Lea). Type (unique), I. 11796

Structurally close to *S. arithmeticus* and *S. quinquenotatus*, but with very different markings; the four spots on the elytra are larger than on the latter species, the outer ones are much in the same positions, but the inner ones are much nearer the base; on the prothorax the black mark covers about the basal third, and has a subtriangular extension almost to the apex.

### **STENOTARSUS BIMACULIPENNIS** sp. nov.

Red, three marks on prothorax, two on elytra, scutellum and part of antennae black, coxae and adjacent parts more or less infuscated. Rather densely clothed with pale, semiupright hair.

Head with minute punctures; with two small but distinct impressions between eyes. Prothorax with sides strongly rounded, apex much narrower than base and

semicircularly emarginate, sublateral striae deep, becoming foveate at base; sides with distinct punctures, elsewhere impunctate. Elytra gently rounded, widest at about basal third; with rows of rather large punctures, becoming smaller towards suture and posteriorly, interstices with small but distinct punctures. Length, 3 mm.

*Hab.* Queensland: Mount Tambourine (A. M. Lea). Type (unique), I. 11795.

Structurally close to *S. quinquenotatus*, but slightly narrower and more convex, prothorax more narrowed in front and elytra behind, legs red and elytra bimaculate. The markings on the prothorax are conjoined at base, and consist of a large equilateral triangle, and a much smaller mark on each side, about half of the surface being dark; the mark on each elytron is of irregular shape, wider than long, and extends across about five interstices at the basal third, and distant about two from the suture, four or five of the apical joints of each antenna are blackish, but the apical half of the eleventh joint is somewhat reddish.

### **STENOTARSUS PALLIDIPENNIS sp. nov.**

Black; elytra, metasternum and abdomen flavous, scutellum and tarsi somewhat darker. Rather densely clothed with pale, semierect pubescence.

Head with numerous small punctures. Antennae rather long; club stout. Prothorax with front angles rounded and somewhat produced, sides elsewhere parallel, sublateral striae deep, becoming foveate at base; punctures sparse and small, but becoming more distinct in lateral gutters. Elytra long, almost parallel-sided to near apex; with rows of punctures of moderate size, becoming smaller towards suture and posteriorly, interstices with minute punctures. Length, 2.75 mm.

*Hab.* Queensland: Cairns district (A. M. Lea). Type (unique), I. 11801.

Structurally close to *S. parallelus*, but prothorax entirely black and elytra entirely pale.

### **DAULIS CIMICOIDES Er.**

In the diagnosis of *Daulis* the legs were noted as "basi vix distantes" and abdomen as composed of "segmentis 6"; these parts not being again referred to under the species.

Several specimens before me, from Tasmania and New South Wales, probably belong to the species; their hind coxae are widely separated at the base, but the middle ones are much closer together and the front ones almost touch; the abdomen at first appears to be composed of five segments only, but on one specimen a minute sixth one (apparently retractile) may be seen. The elytra

have numerous small shining spots, that, from some directions, appear to be in rows, and there are some scattered, irregular, infuscated spots.

### **DAULOTYPUS gen. nov.**

Head moderately large. Eyes large, lateral, and coarsely faceted. Antennae elongate, eleven-jointed, the three apical joints forming a club. Palpi rather long, apical joint of maxillary pair subconical, of labial pair securiform. Prothorax widely transverse, a short deep groove near each side on basal half. Elytra much wider than prothorax. Legs rather long; hind coxae moderately separated, middle pair rather close together, front pair separated by a narrow keel and with their cavities widely open posteriorly; femora unarmed; two basal joints of tarsi rather wide, the second bilobed, third minute and scarcely distinguishable from base of the claw joint. Wings present.

Close to *Daulis*, but palpi longer and apical joint of labial pair of different shape; the prosternum is also acutely keeled between the coxae. On specimens, which are probably males, the abdomen appears to be composed of six segments, of these the first is not much longer than the second, the second-fourth are subequal in length, the fifth is fairly long at the sides but strongly incurved to middle, the sixth is traceable at the sides but not at the middle; beyond it there is a process that may be an extrusible segment. On the presumed females the basal segment is larger, the fifth is rounded in the middle of the apex, and the sixth (unless it is an extrusible process) is rounded at the end and depressed in the middle.

### **DAULOTYPUS PICTICORNIS sp. nov.**

♂ Reddish-flavous, prothorax and parts of head, antennae and legs black or infuscated. Moderately clothed with short, subdepressed, pale pubescence; in addition with numerous erect setae, or short hairs.

Head somewhat irregularly impressed and with irregularly distributed punctures. Clypeus rather large, on a lower plane than interocular space. Labrum large, wider than clypeus, apex bilobed; with dense punctures. Antennae thin, passing metasternum, first joint rather long, third slightly longer than fourth, distinctly longer than second and slightly shorter than first, ninth and tenth slightly longer than the preceding ones and dilated to their tips, eleventh slightly longer than tenth and somewhat pointed. Prothorax about twice as wide as long, sides narrowly margined, widest near apex, then rounded to apex, incurved towards and then parallel to base; a deep, slightly oblique impression commencing near each hind angle and terminating (but shallower) near apex, obliquely traversed by a shallower impression; a narrow deep impression at base; punctures

dense but not very large on sides, smaller and sparser in middle. Scutellum briefly triangular, almost impunctate. Elytra much wider than prothorax at base, widest about middle, shoulders strongly rounded, sides rather widely margined except at base and apex; with close-set but somewhat irregular rows of rather long punctures, becoming crowded and smaller posteriorly. Under-surface with irregularly distributed punctures. Femora rather stout, hind ones not passing fourth abdominal segment; tibiae rather long, hind pair incurved and dilated at middle. Length, 5-5.5 mm.

♀ Differs in being somewhat wider and more convex, prothorax and legs entirely pale, hind-tibiae not dilated or incurved in middle, and in the abdomen.

*Hab.* Queensland: Cairns district (Blackburn's collection and A. M. Lea), South Johnstone River (H. W. Brown). Type, I. 5234.

On the male the prothorax is black or almost so, the head is more or less deeply infuscated, the antennae have five or six of the basal joints partly or entirely pale, the following joints blackish, the apical half of the eleventh joint, however, is conspicuously paler than its basal half; the apical half of the femora and parts of the tibiae are also more or less deeply infuscated; on the female the only dark parts are four or five joints of the antennae (the tips being pale as in the male). The hind tibiae of the male have a narrow impression on the upper-surface, marking off the dilated inner portion. The joints of the club are compressed so that, although considerably wider than the preceding joints, from some directions they appear to be of the same width. The X-shaped impression on each side of the prothorax is distinct from most directions, especially on the male, but its parts are of uneven depths. On some parts of the elytra the punctures appear to be slightly geminate in arrangement, but posteriorly their systematic arrangement disappears.

### **EROTENDOMYCHUS** gen. nov.

♂ Head small; clypeus narrow, labrum small. Eyes small, lateral, prominent, coarsely faceted. Antennae with three-jointed club. Palpi small, apical joint conical. Prothorax widely transverse, sides finely margined, without deeply impressed sublateral or basal lines. Scutellum small. Elytra rather long, closely applied to prothorax; epipleurae narrow, and disappearing beyond middle. Mesosternum with intercoxal process subconical, its tip rounded and produced to between bases of front coxae. Metasternum elongate; side pieces narrow. Abdomen with basal segment slightly longer than three following ones combined, these subequal, fifth slightly shorter than two preceding ones combined. Legs moderately long, front coxae almost touching, their cavities open behind, middle coxae moderately the hind ones widely separated; femora unarmed; tibiae rather

thin, but somewhat dilated to tips; tarsi four-jointed, third joint small, claws simple. Wings atrophied.

Apparently an aberrant genus of the Endomychidae (Leconte records *Aleria* as being without the characteristic sculpture of the pronotum of that family); at first glance the species described below appears to be a small erotylid, but the tarsi are truly tetramerous, the third joint (although larger than in most Australian genera of the Endomychidae) being much smaller than the second, not hairy and slightly produced under the base of the claw-joint. The prosternum is ridged along the middle, and, when closely applied to the mesosternum, the ridge appears to touch the intercoxal process of the latter; it really, however, does not extend to between the middle of the front coxae. Closely embracing each hind coxa there is, on the abdomen, a narrowly impressed line, but the space enclosed could hardly be regarded as an abdominal plate, as in many of the Erotylidae. Some specimens have thicker and longer legs and antennae than others, and these are probably males, but there are apparently no distinct external indications of sex. A second species, from Mount Tambourine, is in the Museum, but as it is represented by an entirely pale (probably immature) specimen, it has not been described.

### **EROTENDOMYCHUS BIMACULATUS sp. nov.**

Plate iv, fig. 10.

Red or reddish-castaneous, most of pronotum and two large spots on elytra black. Upper-surface glabrous, under-surface, legs and antennae minutely pubescent.

Head with minute punctures; clypeus convex in middle, depressed on each side. Antennae extending to about middle of metasternum, first joint moderately large, second-eighth about as long as wide, or slightly transverse, ninth larger and more transverse, tenth still larger, eleventh slightly longer and wider than tenth. Prothorax almost twice as wide as long, sides gently incurved near base, hind angles almost rectangular, the front ones rounded, apex gently incurved to middle, base bisinuate; with rather sparse and small but sharply defined punctures, becoming more numerous on sides and parts of base. Elytra at base slightly wider than prothorax, widest at about basal third, thence evenly rounded to apex; with rows of rather small punctures. Under-surface with sparse and minute punctures. Length, 2.75–3 mm.

*Hab.* Victoria: Dividing Range (Blackburn's collection); New South Wales: Mittagong (A. M. Lea). Type, I. 11802.

A rather elongate-elliptic, flat species. On most of the specimens the pronotum is entirely black, or with the front angles at most obscurely diluted with

red, on others the front angles are distinctly reddish, on one specimen the red extends across the whole apex (and its elytral spots are deeply infuscated instead of black); the elytral spots are median and are usually round, each occupies about two-thirds of the space between the suture and side; but, on the only specimen from Mittagong, the spots are dilated so as to form a fascia occupying rather more than the median third (except that the suture is obscurely diluted with red). On some specimens the base of the prothorax has a small vague depression on each side, but on most of them the base is quite flat. The elytral punctures are small and rather distant in the rows, without the least evidence of striation (except close to the suture posteriorly); from most directions they appear to be sparsely scattered at random.

### **GEOENDOMYCHUS gen. nov.**

Head rather wide, clypeal sutures distinct. Eyes small, lateral, prominent, coarsely faceted. Antennae with nine joints, three forming a club. Apical joint of maxillary palpi rather large and subconical; of labial palpi rather large and dilated to apex, but scarcely securiform. Prothorax widely transverse, with a rather deep curved impression towards each side. Scutellum small. Elytra short, sides strongly rounded and subcontinuous with those of prothorax; epipleurae wide, almost flat, and continuous to apex. Prosternum with a rather wide, flat, bistriated intercoxal process, its posterior end truncated. Metasternum moderately long, episterna narrow. Abdomen apparently composed of six segments, but the apical one small and extrusible. Legs not very long, front coxae subglobular, their cavities widely open posteriorly, middle and hind coxae widely separated; femora unarmed; tibiae rather thin; tarsi thin, apparently three-jointed; claws simple.

At first glance *G. pubescens* looks like a short *Scymnus* or *Rhizobius* of the Coccinellidae, and under a high power I cannot make out the tarsi to be anything but three-jointed; but the nine-jointed antennae, nonsecuriform palpi, and sculpture of prothorax exclude it from that family. The wings are long, thin and hardly more than filaments, not fringed (as in the Corylophidae), and certainly useless for flight. The mandibles are bifid. Type of genus: *G. pubescens*.

### **GEOENDOMYCHUS PUBESCENS sp. nov.**

Castaneous, elytral epipleurae, legs, antennae and palpi somewhat paler. Moderately clothed with short, pale, subdepressed pubescence.

Head feebly convex, with sparse punctures. Antennae moderately long, first joint stout, its base partly concealed, second and third elongate, second stouter than third, fourth short, fifth and sixth still shorter, seventh subglobose, about twice as long and twice as wide as sixth, eighth scarcely longer but more

transverse, ninth briefly obpyriform, slightly wider and distinctly longer than eighth. Prothorax at base fully four times as wide as the median length, sides strongly rounded and finely margined, apex deeply emarginate and about half the width of base, base widely bisinuate and feebly margined, a deep, narrow, curved stria near each side, but terminated before middle; punctures inconspicuous. Elytra scarcely longer than greatest width (at about basal fourth), strongly and evenly convex, sides finely margined; with dense and small but in places fairly distinct punctures; epipleurae faintly wrinkled, feebly diminishing in width posteriorly. Length, 1.5–1.75 mm.

*Hab.* Lord Howe Island (A. M. Lea). Type, I. 11803.

A short strongly convex species of which twenty-two specimens were obtained by sieving fallen leaves. The base of the prothorax is very narrowly infuscated; three specimens are entirely flavous, probably from immaturity; another has the medio-basal portion of the elytra slightly stained with piceous. The pubescence appears to be easily abraded.

### **GEOENDOMYCHUS GLABER** sp. nov.

Castaneo-flavous, appendages slightly paler. Prothorax and elytra glabrous, elsewhere feebly pubescent.

Head gently convex, a feeble depression near each eye; punctures inconspicuous. Antennae nine-jointed, two basal joints rather large; club three-jointed. Prothorax at base fully four times as wide as the median length, sides strongly rounded and very finely margined; apex rather deeply emarginate, a narrow deep line near each side, with which it is parallel, traceable from base to apex; impunctate. Elytra with outlines subcontinuous with those of prothorax, sides strongly rounded and finely margined; with minute punctures. Interecoxal process of prosternum dilated to and truncated at posterior end, a fine stria on each side. Length, 1.3–1.5 mm.

*Hab.* Queensland: Hamilton (C. J. Wild); New South Wales: Richmond River, from a nest of termites (A. M. Lea). Type, I. 12029.

The outlines, under-parts, legs, antennae and palpi are much as in the preceding species, from which it may be readily distinguished by its glabrous upper-surface, and longer sublateral striae of prothorax.

### **ENCYMON CLAVICORNIS** Blackb.

Mr. Arrow<sup>(5)</sup> states that this species is an *Encymon*; it was originally referred to *Mycella*, but subsequently made the type of the new genus *Cranterophorus*. The type was described as blackish-aeneous, with the prothorax

(5) Arrow, Trans. Ent. Soc. Lond., 1920, p. 3.



and femora red, such as is common with specimens from New South Wales and Queensland; but occasionally the elytra are purple. A specimen, from Aru, has purple elytra, but otherwise agrees with the typical form. Many specimens from New Guinea (St. Joseph's River and the Madang district) have the legs uniformly black and the elytra violet.

**MYCELLA LINEELA** Chp.

The markings of this species consist of a long pale vitta on each elytron, conjoined or not to a small outer spot near the base, occasionally the latter being absent.

**PERIPTYCTUS RUSSULUS** Blackb.

This species occurs in Tasmania (Wilmot, Ulverstone, Mole Creek, and Hobart) and New South Wales (Forest Reefs), as well as in Victoria.

**var. BILINEATUS** var. nov.

Ten specimens, from Forest Reefs, differ from the common form in having a distinct infuscated line towards each side of the prothorax, instead of the discal portion rather lightly infuscated, but as they were obtained with specimens of the typical form, and are structurally the same, I cannot regard them as representing more than a variety.

**FAMILY CORYLOPHIDAE.**

**APHANOCEPHALUS PUNCTULATUS** Blackb. (formerly  
**ELEOTHREPTUS**).

On the typical form of this species the prothorax, except that the sides are pale, and elytra are of a very dark brown; but on some specimens those parts are black or almost so; others have the whole upper-surface of a dingy brown. It was referred to the Endomychidae by Blackburn, who proposed a new genus for it, but Arrow,<sup>(6)</sup> from examination of the type, referred it to *Aphanocephalus* (Corylophidae). It occurs in Victoria (Alps, Geelong, and Forrest), as well as in South Australia.

**APHANOCEPHALUS POROPTERUS** sp. nov.

Blackish, sides of prothorax and most of under-surface obscurely paler, legs still paler; elytra with flavous markings. Moderately clothed with short, ashen pubescence.

(6) Arrow, Trans. Ent. Soc. Lond., 1920, p. 3.

Head with small, dense punctures on basal half. Antennae with first and ninth joints large, the latter forming a club. Prothorax widely transverse, sides strongly rounded and distinctly margined, apex gently incurved to middle and about half the width of base; with dense and small but sharply defined punctures. Elytra slightly wider than prothorax, sides distinctly margined; with dense and rather coarse punctures. Under-surface with dense and sharply defined but not very large punctures, larger on sides of metasternum and on basal segment of abdomen than elsewhere. Length, 1.5 mm.

*Hab.* Queensland: Cairns district (A. M. Lea). Type (unique), I. 11797.

Very distinct by the coarse punctures and distinct markings of elytra; the latter may be variable; on the type they consist, on each elytron, of a small spot on the shoulder, a somewhat S-shaped mark extending, near the suture, from close to the base to the middle, and an elliptical mark (enclosing a dark spot) obliquely placed on the apical third. The margin of each elytron, on its apical third, appears as a series of three short straight lines, instead of being evenly rounded.

### **APHANOCEPHALUS NITIDUS sp. nov.**

Black, sides of prothorax, tips of elytra and most of under-surface obscurely paler, elytral epipleurae and legs still paler. Under-surface and legs finely pubescent, upper-surface scarcely visibly so.

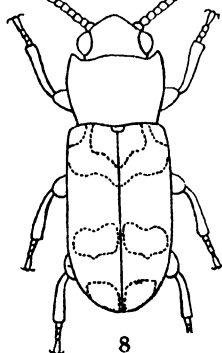
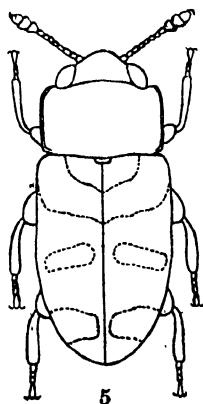
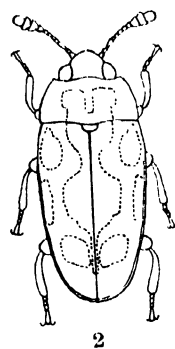
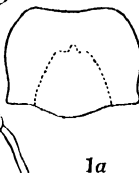
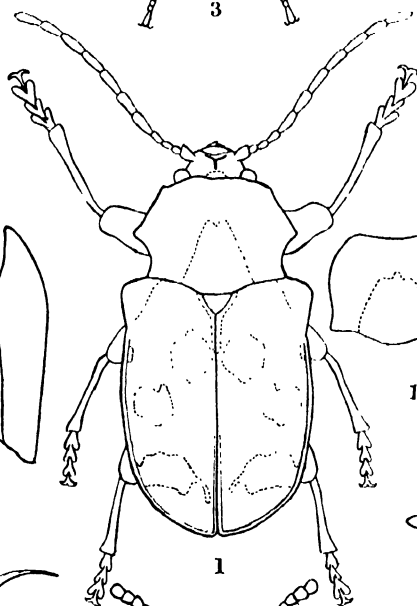
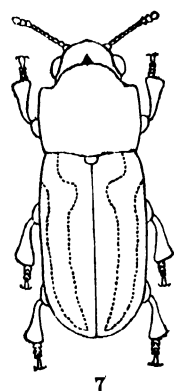
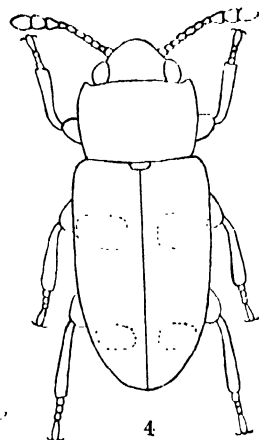
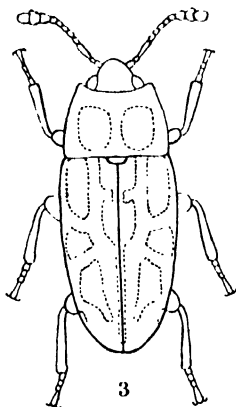
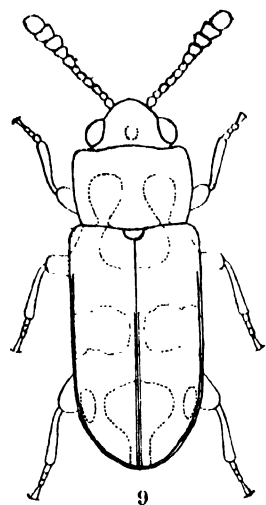
Head with dense punctures, sharply defined near base, but much less distinct in front. Antennae with ninth joint forming a rather large truncated club. Prothorax widely transverse, sides strongly rounded and finely margined, apex incurved to middle and scarcely half the width of base; with dense and small but rather sharply defined punctures. Elytra with outlines continuous with those of prothorax, but margins somewhat wider; the punctures somewhat sparser and slightly larger. Under-surface with dense punctures, slightly larger on sides of metasternum and on basal segment of abdomen than on elytra. Length, 2.25–2.5 mm.

*Hab.* Queensland: Mount Tambourine (A. M. Lea). Type, I. 11798.

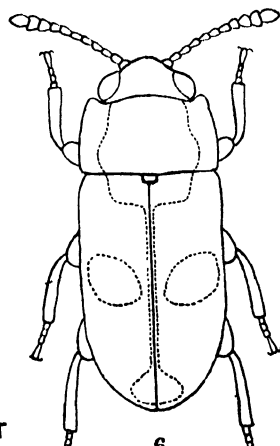
Larger and more shining than *A. punctulatus* and *A. potamophilus*, upper-surface with very indistinct pubescence, and punctures much smaller. A second specimen is somewhat smaller and paler than the type.

**Explanation of Plate iv.**

- Fig. 1. *Macrogonus maculatus* Lea. 1a, prothorax of female.  
Fig. 2. *Episcaphula nigronotata* Lea.  
Fig. 3. *Episcaphula atromaculata* Lea.  
Fig. 4. *Thallis vinula* Er.  
Fig. 5. *Thallis alternata* Lea.  
Fig. 6. *Thallis subtuberculata* Lea.  
Fig. 7. *Thallis hoplostetha* Lea. 7a, side view of prosternum of male.  
Fig. 8. *Thallis metasternalis* Lea.  
Fig. 9. *Thallis tricolor* Lea.  
Fig. 10. *Erotendomychus bimaculatus* Lea, tarsus.



NBT





# STUDIES IN AUSTRALIAN AQUATIC HEMIPTERA

No. 1.

By HERBERT M. HALK, SOUTH AUSTRALIAN MUSEUM.

## FAMILY CORIXIDAE

Text figs. 338-350.

THE Corixidae, popularly known as water-boatmen, differ considerably from all other Cryptocerata. The head (fig. 338A), which is about as wide as the thorax, is obliquely recurved below, the apex reaching to between the anterior coxae; the mouth is very short, flattened, and the aperture through which the setaceous mouth parts are protruded is situated above the tip of the clypeus. The eyes are large and widely separated and the hinder margin overlaps the prothorax. Each pair of legs is of different form and utility. The anterior members are short. In *Corixa* and sub-genera the tarsus or pala is extremely modified, particularly in the male, and varies in shape in the different species: it consists of a single scoop-like joint, and seen sideways is generally falcate or cultrate (fig. 338B); the lower margin is furnished with two rows of bristly hairs, in one of which rows the hairs are very long. On the inner surface of the male pala are one or more rows of chitinous teeth or pegs, and it is considered that the characteristic stridulation beneath the water is produced by rubbing this tarsal comb across an area, also covered with tiny pegs, and situated near the base of the opposite femur. As pointed out by Kirkaldy<sup>(1)</sup> and others, the number of pegs in the comb affords a useful distinguishing specific character.

In *Micronecta* the pala of the male terminates in a large flattened claw (fig. 346), which in the female is represented by a stiff seta.

The middle legs are long and attenuated and each terminates in two slender claws; the posterior tarsus is flattened, broadened, and fringed with long hairs.

The life colouration is a little variable, immature imagos being usually paler. After death some changes are apparent: irregular infuscations, having no relation to the general colour scheme, sometimes appear; in the descriptions no note is made of inconstant and irrelevant staining; in specimens not fully adult the colour becomes yet paler, while the external parts may shrivel so that the relative proportions are destroyed.

(1) Kirkaldy, Journ. Quekett Micro. Club (2), viii, 1901, p. 35 (Bibliography) and Proc. Hawaiian Ent. Soc., i, 1906, p. 15.

The odour which is characteristic of Heteropterous bugs generally is noticeable, but not pronounced, in members of this family.

**Habits.** With the aid of the oar-like hind-legs the Corixidae propel themselves rapidly through the water, or anchor themselves to aquatic plants or other submerged objects by means of the long intermediate tarsal claws; a copious supply of air is carried under water, and the insects remain below the surface for long periods. Living animal food is captured with the anterior legs, with which prey is firmly grasped while the nutriment is extracted. Professor H. B. Hungerford<sup>(2)</sup> states that they are largely herbivorous, and under his observation a species subsisted throughout the life cycle upon the brown sedimentary material which occurs on the bottoms of pools. In 1873 F. B. White<sup>(3)</sup> wrote: "On examining a stone from which a *Corixa* had apparently been obtaining food, a

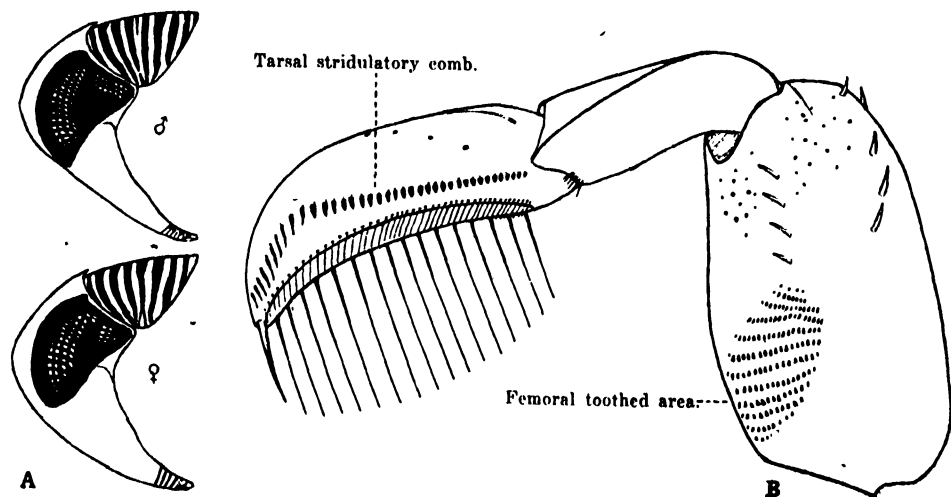


Fig. 338. *Arctocorisa australis*; A, profile of head; B, anterior leg of male.

small *Alga* and a few *Rotifera* and other animalcules were seen." The Indian *Micronecta striata*<sup>(4)</sup> (*Corixa ovirora* Westwood) is reported to feed upon the eggs of fishes.

For months I kept in aquaria several species of Corixidae, as well as members of Notonectidae and Naucoridae, and during that time they were fed only upon larvae of *Culex fatigans* and *Scutomyia notoscripta*. Even newly-hatched Corixidae were observed to capture tiny mosquito larvae, increasingly large examples being taken during the successive stages of the metamorphosis. If, as

(2) Hungerford, Science, n.s., xlv, 1917, p. 336.

(3) White, Ent. Month. Mag., x, 1873, p. 79.

(4) Westwood, Proc. Ent. Soc., 1871, p. iv.

seems certain, aquatic bugs feed upon these larvae in their native ponds, there is every reason to suppose that they mitigate the mosquito nuisance, and are thus of considerable economic importance. The malaria-carrying mosquitoes particularly, breed in isolated pools and temporarily inundated grass-grown hollows, localities in which fishes do not usually occur, but to which aquatic bugs, possessing the power of flight, have easy access.

**Reproduction.** Excepting in *Diaprepocoris*, the sexes are easily distinguished, the structure of the palae alone being sufficient indication. The abdomen of the female is symmetrical, while in that of the male the segments are irregular and distorted (fig. 339A). The male is often also provided with a curious organ, situated on the sixth segment of the upper side of the abdomen. This was discovered by F. B. White<sup>(5)</sup> and designated the strigil or strigiliform process. It consists of a somewhat convex disc mounted on a pedicel, and composed of overlapping, striated, chitinous plates, the striae being directed inwards (fig. 345s):

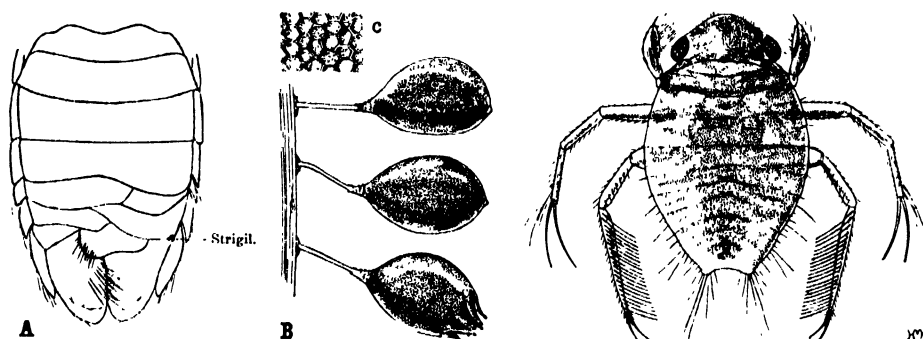


Fig. 339. *Porocorixa eurynome*; A, upper side of abdomen of male; B, eggs and larva, probably of this species.

the utility of this structure is not clear, but it has been suggested that it constitutes portion of a secondary stridulatory apparatus, possibly used during flight. In the hitherto unknown male of *Diaprepocoris* there is yet another form of abdominal apparatus, also apparently stridulatory (fig. 350s).

Although a species may vary in size in different localities, the females are, as a rule, slightly larger than the males.

Fig. 339B shows the eggs and newly-hatched larva of an Australian species, probably *Porocorixa eurynome*. In autumn (April) 1921, numbers of the ova were deposited on the thicker stems of a water-plant (*Potamogeton* sp.) in the Torrens River, Adelaide; the smooth stems of a grass overhanging the banks, and in places submerged, were also utilized, but the ova were always attached to

(5) White, *loc. cit.*, p. 60.



vegetation shallowly situated in the slowly running stream. The eggs are about 1.0 mm. in length, irregularly oval in shape, and somewhat flattened on one side; the micropyle is situated in a nipple at the apex; the surface is minutely wrinkled and is marked with a rather uneven, tiny, reticulating pattern, consisting mostly of hexagons, but with occasionally a five-sided figure interposed (c). Each egg is borne on a translucent, thread-like pedicel connected to a disc, which is firmly attached to a plant stem. The pedicel, notwithstanding its fragile appearance, is extraordinarily strong, flexible, and elastic; on being stretched to about four times its normal length it readily returns when released. If sufficient force is used to drag the egg from the object to which it is connected, the disc usually becomes detached, but the connecting pedicel rarely breaks.

As development proceeds the eyes of the enclosed embryo become increasingly visible on each side, at about the apical third of the egg-case; seen through the semi-transparent chitin they appear reniform and of a castaneous colour. In hatching, the larva bursts open the top of the egg-case, the apex being split into several teeth. The newly-emerged bug is 2.5 mm. in length and, excepting for the eyes, is almost transparent, with very faint traces of pigment. The compound eyes are small and consist of comparatively few facets, the interocular space being much wider than in the adult. The posterior tarsus is provided with two terminal claws, and throughout the immature stages is monomerous.

In an aquarium the late pupal stage was attained five months after hatching, when the bugs unfortunately perished before the identity of the species could with certainty be established.

The Corixidae are of almost world-wide distribution. Six species have hitherto been recorded from Australia, five of these being named by Kirkaldy and one by Fieber. Eight additions are herein recorded, some of which have a wide range over the continent; the types are deposited in the South Australian Museum. Several species are often associated in the same situation, and recently a single pool near Adelaide yielded eight of those enumerated in this paper. A single specimen only has been received from Western Australia; more must, of course, occur there, and doubtless further species remain to be recorded from this and other States. In 1893 Skuse<sup>(6)</sup> wrote: "Three species of *Corixa* common in the ponds about Sydney," and "Two species, rather abundant," of *Nigara (Micronecta)*. No other paper dealing with the Cryptocerata has been published in Australia.

here express my thanks to Mr. W. W. Froggatt, of the Agricultural Department, Sydney, and to the Directors of the Australian Museum, Sydney, and National Museum, Melbourne, for the opportunity of examining the Corixidae preserved in these institutions,

## KEY TO THE AUSTRALIAN GENERA.

- a. Scutellum almost or entirely concealed . . . . . *Corixa* and sub-genera
  - b. Pronotum and hemelytra more or less  
rastrate; pronotum with transverse  
markings . . . . . *Arctocorisa*
  - bb. Pronotum and hemelytra densely punctured; pronotum without transverse  
markings . . . . . *Porocorixa* subg. nov.
- aa. Scutellum not concealed.
  - c. Scutellum small; antennae three-jointed . . . *Micronecta*
  - cc. Scutellum large; antennae four-jointed . . . *Diaprepocoris*

**CORIXA Geoffroy.****Sub-genus ARCTOCORISA Wallengren.**

*Arctocorisa* Walleng., Ent. Tidskr., xv, 1894, p. 159.

*Basileocorixa* Kirk., Entomologist, 1898, p. 253.

Type, *A. variegata* Walleng.

May be separated from other sub-genera of *Corixa* by the following characters: Face excavated in male, convex in female. Palal comb composed wholly of strong chitinous pegs, none being bristle-like. Pronotum more or less rastrate and with transverse lineations. Hemelytra with vermiculate markings. A strigil present on the right side of abdomen of male.

**ARCTOCORISA AUSTRALIS Fieber.**

*Corixa australis* Fieber, Abhand. der königl. böhm. Ges. der Wiss. (5), vii, 1852, p. 232, pl. i, fig. 15; Kirk., Ann. Mag. Nat. Hist. (6), xx, 1897, p. 55.

♂ Head ochraceous, prominent, longer than its width at base between eyes, evenly rounded in front; a longitudinal median carina, slightly produced at basal

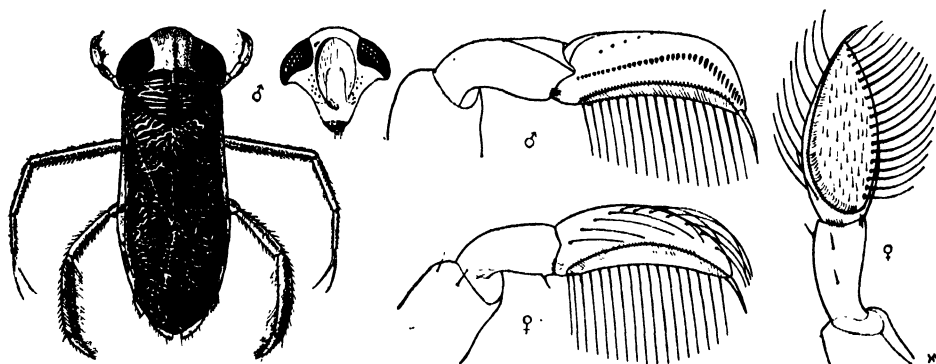


Fig. 340. *Arctocorisa australis*.

margin of head and with an impressed line of punctures on each side and another near the eye; facial impression obovate, large and deep, extending almost to the vertex, clothed with fine pale hairs; eyes directed moderately backwards, beyond and over the anterior pronotal angles, inner margins a little divergent. Pronotum black, crossed by seven to ten narrow, irregular yellow lines; twice as broad between humeral angles as medial length; rastrate and with a median carina, most distinct anteriorly; posterior margin angularly convex, lateral margins short; angles obtuse. Hemelytra black, marked with yellow, sparsely clothed with long, fine, yellow hairs; clavus with sub-transverse, oblique, angularly-wavy lines, the anterior ones broader, so that the base of the clavus appears paler; finely rastrate; corium with angular, interrupted and somewhat transverse lines; a broken yellow line sub-marginal to the costal edge; membrane with transverse lines, twisted on the disc, parallel on the inner margin; embolium dull, pale livid, darkest anteriorly. Sternum ochraceous, in parts black; xyphus blackish, acute; underside of abdomen pale testaceous, darkened anteriorly; connexivum pale yellow; strigil of comparatively large size, sub-rectangular, with four to six broad rows of striae; legs ochraceous; anterior tibiae stout, about four-fifths as long as palae, which are cultrate, the upper margin almost straight for a great part of its length, suddenly bent downwards and forwards to apex; claw long, stout; thirty-six to forty stridulatory pegs in a single row following the curve of the superior margin; apical pegs longest, subulate, the series regularly decreasing in size backwards; posterior teeth short, sub-ovate; intermediate claws about as long as tarsi. Length, 7 mm.

♀ A little larger than the male. Frontal margin of head somewhat angularly rounded; interocular carina continued below on to face, which is convex, punctured, and clothed with pale yellow hairs. Palae falcate, upper edge very convex. Underside of abdomen ochraceous, darkened marginally. In two examples from Murray River the head is dark castaneous. Length, 7.5 mm. to 8 mm.

*Hab.* South Australia: Adelaide (A. H. Elston and H. M. Hale), Murray River (J. G. O. Tepper and H. M. Hale), Goolwa and Finnis River (A. Zietz); Victoria: Port Phillip (type locality); Tasmania (British Museum).

*A. australis* is so far recorded from southern Australia and Tasmania only. The female has not previously been described.

### **ARCTOCORISA TRUNCATIPALA sp. nov.**

♂ Head testaceous, a little longer than its width, evenly rounded in front; a longitudinal, median carina, slightly and angularly produced at basal margin

of head; an impressed line of punctures on each side of carina and another bordering the eye; facial impression obovate, very large and deep, extending almost to the vertex and laterally nearly touching the eyes; eyes directed moderately backwards, beyond and over the anterior pronotal angles, inner

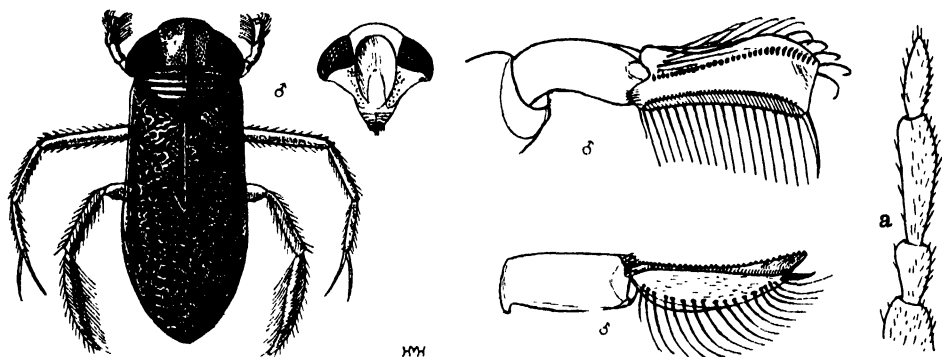


Fig. 341. *Arctocoris truncatipala*.

margins slightly divergent; fourth joint of antennae more than half as long as the third (a). Pronotum black, crossed by six, slightly curved, greenish-yellow lines; twice as broad between humeral angles as medial length; rastrate and with a median carina, most distinct anteriorly; posterior margin angularly convex; lateral margins short; angles obtuse. Hemelytra black, marked with yellow, sparsely clothed with long, fine, yellow hairs; clavus finely rastrate, basally with five or six narrow, irregular, obliquely transverse lines; remainder of wing-covers with many short, angularly wavy markings, on the corium arranged in four distinct longitudinal series, the outer edge forming an interrupted line bordering the anterior margin, but separated from it by a narrow black interspace; tip of membrane black; embolium dull, livid; apex sternum and legs ochraceous; underside of abdomen testaceous; connexives; interyellow; strigil brownish black, of comparatively large size, sub-quadrate, with five broad, more or less regular rows of striae; anterior tibiae stout, about four-fifths as long as palae which, viewed from above, are semi-lunate, narrower at the base; seen sideways they are elongate sub-rectangular, the apex very truncate, as wide as the base and forming a wide angle with the upper and lower edges; base slightly widened; upper edge posteriorly almost straight, a little concave, suddenly convex and bent downwards to the upper apical angle; lower edge gently concave; claw as long as the width of tarsus; thirty-two stridulatory pegs in a single row sub-parallel with the upper margin, extending from the middle of the base to the upper anterior angle; apical pegs longest, subulate, the series regularly decreasing in size backwards, the posterior teeth being stout and sub-oval; intermediate claws about

equal in length to tarsi; tibiae longer; posterior tibiae shorter than tarsi; swimming hairs dark brown. Length, 5.8 mm. to 6.5 mm.

♀ More robust than the male. Head slightly shorter, the frontal margin somewhat angularly rounded; interocular carina extending below on to the face, which is convex, punctured, and with sparse yellow hairs. Palae much as in the female of *A. australis*. Length, 5.8 mm. to 7 mm.

*Hab.* South Australia: Adelaide (type locality, H. M. Hale, A. H. Elston, and Mulvin), Murray River (H. M. Hale), South East (Ziegler), Lucindale (B. A. Feuerheerdt), Myponga (A. H. Elston), Goolwa and Finniss River (A. Zietz); New South Wales: Sydney (Australian Museum), Bungendore, Clarence River, and Hay (A. M. Lea); Victoria: Melbourne (Searle); Tasmania: (A. Simson), Hobart (A. M. Lea). Type, I. 15183.

*A. truncatipala* is allied to the preceding species, but the form is more robust and the head is scarcely as prominent: the pronotal lines are broader and usually in less number, and the hemelytral markings are more broken. It may be readily recognized by the form of the male pala, which does not taper to a point, but terminates in a straight, knife-like edge; this pala is figured as seen sideways and from beneath. In a large series the following variations occur: Six to eight transverse lines on the pronotum, generally regular, but sometimes forked, looped or conjoined; the former number is more usually present. Thirty-two to thirty-five pegs in the palal comb. The intermediate claws vary in length and may be as long as the tibiae. The sternum is, sometimes nigrescent and the xyphus and coxae black.

The species is plentiful in the <sup>ad</sup> <sup>be</sup> near Adelaide during the summer. Pupae and immature imago are of <sup>br</sup> <sup>ion</sup> colour with very faint markings, which rapidly darken as development <sup>us</sup> <sup>ded</sup>; an orange streak margins the base of the head. The light lines and <sup>ark</sup> <sup>caulations</sup> of a living mature example are barely discernible to the naked eye <sup>g</sup> <sup>appearing</sup> almost black.

### ARCTOCORISA SUBLAEVIFRONS sp. nov.

♂ Head ochraceous, basally testaceous, about as long as width at base between eyes, rounded and very little produced in front; with a median, interocular carina, slightly produced at hinder margin of head; an impressed line of punctures on each side of the carina and another less distinct series near <sup>ca</sup> <sup>eye</sup>; face flattened, punctured; impression hardly discernible, closely punctured clothed with yellow hairs; very shallow, short, and narrowly ovate; eyes directed backwards, beyond and over the anterior pronotal angles, the inner margin little divergent. Pronotum brownish-black, crossed by eight narrow irreg

yellow lines; nearly twice as broad between humeral angles as medial length; rastrate, and with a median carina, most distinct anteriorly; posterior margin angularly convex; lateral margins short; angles roundly obtuse. Hemelytra brownish-black, marked with yellow, with a few fine yellow hairs; sutures margined with yellow; clavus with oblique, sub-transverse, angularly-wavy lines, rastrate; corium with fragmentary wavy lines, arranged in four rather ill-defined longitudinal series; markings on membrane transverse anteriorly, sub-parallel on inner margin and twisted on the disc; embolium pale yellow. Sternum and legs ochraceous; underside of abdomen pale testaceous; strigil dark brown, large, roundly sub-quadrate, with six rows of striae; anterior tibiae stout; palae cultrate,

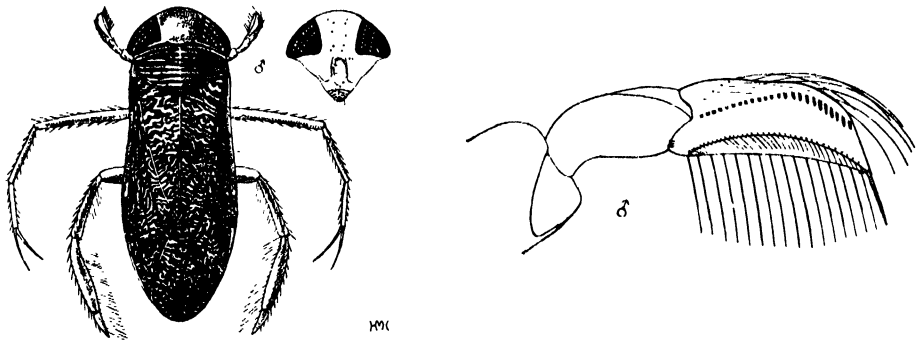


Fig. 342. *Arctocoris sublaevifrons*

sub-truncate, narrowest at base; upper margin almost straight, slightly sinuate, and anteriorly suddenly bent obliquely downwards and forwards to apex; claw rather weak; twenty-four short stridulatory pegs in a single row sub-parallel to the superior margin, not reaching to apex; anterior pegs longest, the series regularly decreasing in size backwards; intermediate claws as long as the tarsi. Length, 6 mm.

♀ Slightly larger and more robust than the male. Palae as in female of *A. australis*, but head shorter.

*Hab.* Victoria: Coromby (type locality, J. G. O. Tepper), Melbourne and Plenty River (Searle), Croydon, Gumbower, and Mount Macedon (National Museum). Type, I. 15184.

The variation is as follows: Pronotal lines seven to eight; palal pegs twenty-one to twenty-four.

Like *A. australis*, this species is of elongate form, but the head is less produced in front. The male differs in the slight facial impression and lesser number of palal pegs.

**POROCORIXA subg. nov.**

Pronotum and hemelytra densely punctate, clothed with short hairs; pronotum without transverse lines; no vermiculate or angulate markings on wing-covers. Male with facial impression, and a strigil on right side of abdomen; face of female convex. Pala with a terminal claw, pegs of stridulatory comb strong.

Type, *Corixa eurynome* Kirkaldy.

Resembles the African *Agraptocorixa* Kirkaldy, but in that genus the pronotum is lightly punctate-rugose and no mention is made of punctation on the hemelytra.

**POROCORIXA EURYNOME Kirkaldy.**

*Corixa eurynome* Kirk., Ann. Mag. Nat. Hist. (6). xx, 1897, p. 54.

♂ Head ochraceous or testaceous, about as long as wide, a little tumid in front, almost evenly concave posteriorly; with a coarse, median longitudinal, interocular carina, on each side of which is an impressed line of punctures, closely

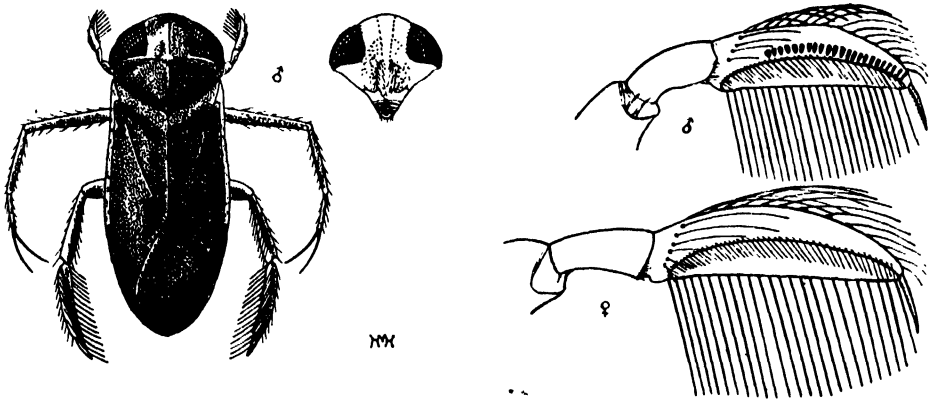


Fig. 343. *Porocorixa eurynome*.

set posteriorly, but becoming more scattered towards the vertex; another line of punctures near each eye, curved inwards near base of head to meet the first series; face ochraceous, punctate, clothed with fine yellow hairs; with a slight depression extending to well above inner margins of eyes, and a shallow, rather narrow, obovate, interior impression reaching to between inner angles of eyes; eyes directed backwards, a little beyond and over the anterior pronotal angles, the inner margins almost parallel, slightly divergent; terminal joint of antennae very short. Pronotum dark olivaceous-brown (appearing almost black in fresh adult examples), clothed with very short black hairs; twice as broad between humeral

angles as medial length, with comparatively large, crowded punctures, almost confluent; anterior margin medianly incised; posterior margin angularly convex; lateral margins short, oblique; angles subacute. Hemelytra dark olivaceous-brown, paler basally; with closely-set punctures as on pronotum, but with longer black hairs; clavus with a short, dark streak near lateral basal angle, sub-parallel with the suture, and a dark marking at the inner and apical angles; claval suture narrowly margined with black; corium darkened at angles and opposite the termination of the embolium, which is pale. Sternum ochraceous; underside of abdomen black anteriorly, testaceous posteriorly, clothed with a very fine, pale pubescence; connexivum testaceous; strigil very small, roundly sub-quadrate, with four broad rows of striae; legs ochraceous, tibiae and tarsi more or less darkened; anterior tibiae about half as long as the palae, which are falcate, evenly rounded above, narrower at the base; claw strong, the inner edge serrate; a single row of about twenty-three stridulatory pegs, following the curve of the lower margin and extending from the apex to three-fourths of the length; apical pegs long, acute, the remainder sub-oval, pointed; intermediate claws as long as, or a little longer than the tarsi, which are little more than half the length of the tibiae; first joint of posterior tarsi as long as the tibiae; swimming hairs black. Length, 8.5 mm. to 9 mm.

♀ Interocular carina, and punctures on head and face, as in male; the slightly depressed area on the face is somewhat raised centrally; face testaceous, with yellow hairs. Underside of abdomen testaceous, posterior segments sometimes darkened; palae relatively longer, but more slender, than in male; claw apparently not serrate. Length, 9 mm.

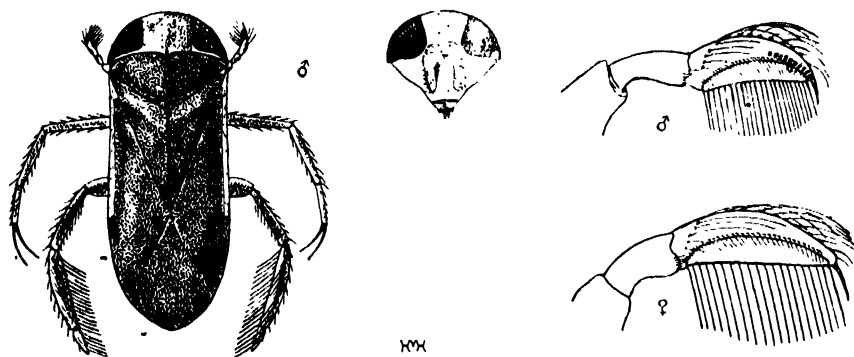
*Hab.* South Australia: Adelaide (J. G. O. Tepper and H. M. Hale), Murray River and Bordertown (J. G. O. Tepper), Blakiston (Driffield); Queensland: Townsville (F. P. Dodd); New South Wales: Mittagong and Clarence River (A. M. Lea); Victoria: (Blackburn), Plenty River (Searle), Mallee (National Museum, and O. Donohue).

It is with some doubt that specimens from the above localities are referred to this species. The author describes the hemelytra as "paler at the base (owing to absence of punctuation)"; in examples now identified the punctures extend over the whole of the wing-covers, excepting the very small, dull, blackish portion which is covered by the pronotum. Both sexes have a longitudinal, median carina on the head, a character assigned only to the female in the original description; the facial impression of the male does not extend "almost to the vertex," and the clothing is dark. The type is from Adelaide River, Northern Territory (British Museum).



**POROCORIXA PARVIPUNCTATA** sp. nov.

♂ Head pale ochraceous, wider than long, almost straight in front, scarcely produced in front of eyes; posterior margin sinuate, medianly angular; crown not conspicuously convex, with a very indistinct interocular carina; a line of small punctures on each side of the median line of the head and another series bordering the inner margin of each eye and bent inwards near the base of the head; face with a punctate, shallow, obovate depression reaching to just above inner angles of the eyes; a small, narrow, interior impression, reaching to between inner angles of eyes; eyes directed moderately backwards, inner margins parallel above, converging on face. Pronotum olivaceous-brown, in parts diluted, clothed with short black hairs, more than twice as broad between humeral angles as medial length; punctures minute, confluent, and forming fine, transverse wrinkles; a

Fig. 341. *Porocorixa parvipunctata*.

feeble median, longitudinal ridge; anterior margin convex, slightly incised medianly; posterior margin sinuately convex; lateral margins very oblique; angles very acute. Hemelytra dark olivaceous-grey, in parts darkened, finely punctured and with black hairs; clavus testaceous basally and darker at angles; corium darkened anteriorly, at apex and below termination of the embolium, which is pale livid with the outer margin black. Sternum pale ochraceous; underside of abdomen dark testaceous, clothed with a fine, yellow pubescence; connexivum yellow, in parts black; strigil black, very small, roundly sub-triangular, with two broad rows of striae; legs testaceous; anterior tibiae more than half as long as palae, which are falcate, evenly convex above, narrower at the base; claw rather short; one short row of ten stridulatory pegs, situated on the apical third of the tarsus; middle pegs longest and stoutest, posterior four conspicuously shorter; intermediate tarsi more than half as long as tibiae, about as long as claws; posterior tarsi longer than tibiae; swimming hairs brown. Length, 6 mm.

♀ Head darkly suffused at base, shorter than in the male; face furnished with yellow hairs; convex, finely punctured. Underside of abdomen testaceous, posterior segments sometimes darkened. Anterior tibiae relatively shorter, and palae longer and narrower than in male. Length, 6 mm. to 7 mm.

*Hab.* South Australia: Adelaide (type locality, H. M. Hale), Mount Lofty Ranges (S. H. Curnow), Reynella (G. Dutton), Murray River (H. S. Cope and H. M. Hale), Bordertown (J. G. O. Tepper), Myponga and Barossa (A. H. Elston), Northern Flinders Ranges (A. H. Elston and H. M. Hale); Central Australia: Opossum Creek ("W. H." Horn Expedition, 1896), Higgin's Dam (South Australian Museum Expedition, 1916); Queensland: Claudie River, N.Q. (J. A. Kershaw), Longreach (A. M. Lea), Charters Towers (Mrs. Black); New South Wales: Broken Hill (F. W. Shepherd), Bungendore and Hay (A. M. Lea), Wagga and Tamworth (W. W. Froggatt); Victoria: Dimboola (J. G. O. Tepper), Melbourne, Plenty River and Wattle Park, Balwyn (Searle); Tasmania: Hobart (A. M. Lea). Type, I. 15185.

This widely distributed species somewhat resembles *P. eurynome*, but is of smaller size and more finely punctured. The head is shorter and less produced in front; the basal margin is more angulated in the middle, so that the posterior angles of the eyes are farther from the margin. The facial impression of the male is less distinct and there are only ten or eleven palal pegs.

During life the head is bent down rather more than is shown in the figure, and seen from above appears much wider than its length; the eyes are wine red.

### **POROCORIXA HIRTIFRONS** sp. nov.

♂ Head ochraceous, distinctly longer than its width at base between eyes, slightly shorter than the pronotum; a little produced in front of eyes; posterior

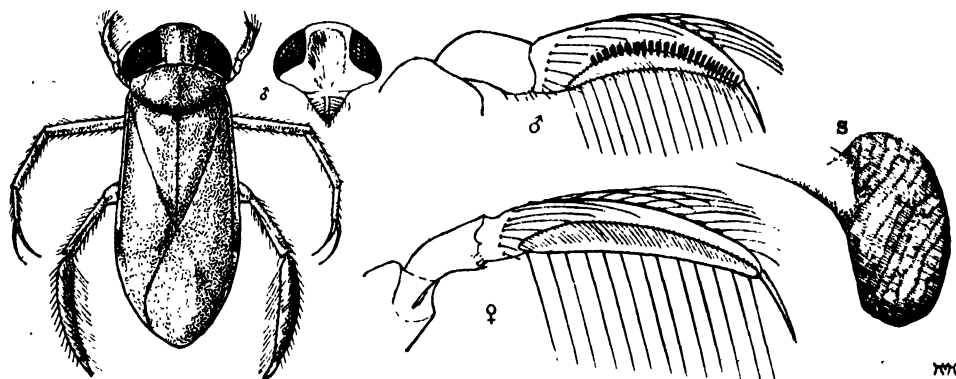


Fig. 345. *Porocorixa hirtifrons*.

margin medianly angular; a longitudinal, interocular carina, dilated anteriorly, with an indistinct line of punctures on each side and another bordering the inner margin of each eye, curved inwards above an indentation next to each posterior angle; face densely covered with long, yellow hairs; impression very large and deep, broadly obovate, extending practically to the vertex and laterally almost touching the inner margins of the eyes; eyes directed moderately backwards, projecting beyond the anterior pronotal angles; inner margins diverging above, parallel on the face. Pronotum ochraceous, posteriorly narrowly margined with castaneous, clothed with a distinct, golden pubescence; about twice as broad between humeral angles as medial length, narrower than the head; punctures small, confluent, presenting an appearance of impressed, irregular lines; an obsolete median carina; anterior margin rounded, very slightly medianly incised; posterior margin evenly rounded; lateral margins moderately short, a little oblique; angles roundly obtuse. Hemelytra pale ochraceous, clothed with golden hairs; punctures dark, small and more or less confluent; inner margin of clavus paler; claval suture and outer edge of corium narrowly margined with castaneous; embolium whitish. Underside and legs stramineous; connexivum yellow; strigil(s) dark brown, very large, nearly 0.5 mm. in length; suboval, with about twelve rather irregular rows of striae; anterior tibiae stout, less than half as long as the palae, which are long, narrowly falcate, widest near the base; claw long and strong; twenty-five stridulatory pegs in a single row placed near, and following the curve of, the lower margin, not extending to the base; pegs regularly decreasing in length backwards, anteriorly triangular, pointed, thinner than, and about twice as long as, the posterior ones, which are stout suboval and pointed; intermediate tarsi a little more than half as long as tibiae, about as long as claws; posterior tarsi wide, longer than tibiae; swimming hairs brown. Length, 8 mm.

♀ Head a little shorter and wider; face slightly convex, densely clothed with golden hairs, punctured. Posterior margin of pronotum more widely edged with castaneous. Palae longer, narrower, and less curved. Length, 8 mm.

*Hab.* South Australia (Rev. A. P. Burgess); Central Australia: Cooper Creek (type locality, J. G. Reuter); Queensland: Cunnamulla (H. Hardecastle). Type, I. 15186.

The almost elliptical pronotum is furnished with longer and paler hairs, and the strigil is very much larger, than in either of the two preceding species. A more elongate form and lighter colouration, the large, densely clothed facial impression and the palae afford further distinguishing characters.

In the single imperfect example from Queensland the pronotum is light olivaceous in colour.

**MICRONECTA Kirkaldy.**

*Micronecta* Kirk., Entomologist, 1897, p. 260.

*Sigara* Fabr., Ent. Syst., iv, 1794, p. 59 (part), and Syst. Rhynch., 1803, p. 104 (part).

Type, *M. minutissima* Linnaeus.

The members of this cosmopolitan genus are all of small size; none is over 5 mm. in length, most are considerably smaller. The antennae are three-jointed (fig. 346a), the face is convex in both sexes, and the asymmetry is to the right in the male. Three species have been recorded from Australia by Kirkaldy, but these have not been recognized amongst the material now dealt with. As I have not had opportunity of examining the types, the author's descriptions are quoted verbatim. In this, or indeed any other group of small insects in which specific differences are comparatively slight, it is advisable, if not absolutely necessary, that descriptions should be accompanied by figures.

**MICRONECTA BATILLA sp. nov.**

♂ Head pale ochraceous, with a large, sub-circular marking (of darker colour anteriorly) which almost touches the eyes and reaches just beyond the vertex; a dark orange median, longitudinal line; posterior margin darkly suffused and with a black, central tubercle; long, prominent, much produced in front of eyes, about one and one-half times as long as the pronotum, its length greater than width at base between eyes, the inner margins of which are divergent, the interocular width anteriorly being greater than the length of the head. Pronotum pale olive green, with a faint, smoky-brown, horizontal fascia, which is interrupted in the middle and does not reach the lateral edges; almost elliptical, short, three and one-half times as broad between humeral angles as medial length; rather rugose, with irregular, transverse, punctured striae; lateral margins extremely short. Scutellum pale olive green, transversely wrinkled. Hemelytra of like colour, apically pitchy, basally paler; densely punctured, costal margins pale

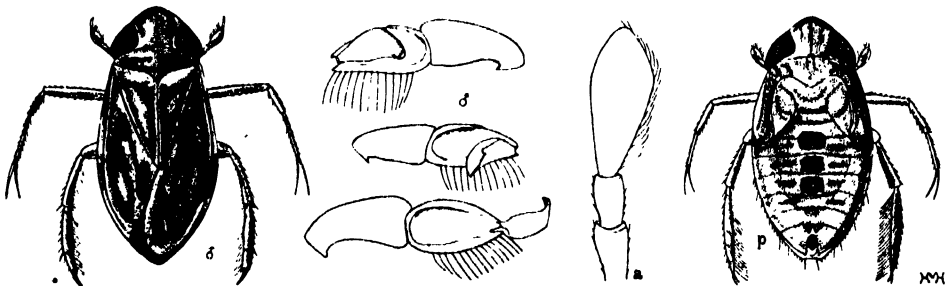


Fig. 346. *Micronecta batilla*.

with two dark streaks; clavus with pitchy, fasciate lines, sub-marginal to the edges, widened and darkened basally, and in a lesser degree medianly and apically; claval suture black; corium with four somewhat interrupted, blackish lines of varying thickness, lateral margin anteriorly pale ochraceous; apex of membrane roundly angulate. Sternum ochraceous; underside of abdomen pitchy, in parts ochraceous; legs pale ochraceous, in parts infuscated with orange; intermediate claws a little shorter than tarsi, which are darker at the tips. Length, 2.75 mm. to 4.5 mm.

♀ A little more robust. Underside pale ochraceous. Length, 3 mm. to 5 mm.

*Hab.* South Australia: Adelaide (H. M. Hale), Mount Lofty Ranges (type locality, H. M. Hale, Driffield, J. Formby, and Dr. L. Richter), Myponga (R. F. Kemp), Goolwa (A. Zietz), Yacka (A. H. Elston); Queensland: Gladstone (A. M. Lea); New South Wales: Coolabah (W. W. Froggatt), Hay (A. M. Lea); Victoria: Melbourne (Searle), Lake Hattah (J. E. Dixon). Type, I. 15187.

This species is variable in colour and in size, but in a series of specimens from any one locality these characters are fairly constant. The pronotum is sometimes smooth, and may be unicolorous or with faint indications of a transverse fascia; sometimes it is piceous, with the anterior and posterior edges and a longitudinal, median line of light colour; in a few examples the posterior margin only is pale. The base of the hemelytra is not always paler. Specimens from the Adelaide plains are dark olivaceous-brown, with the orange marking on the head indistinct. A single male from Queensland is fuscous with castaneous markings. Another colour variety is castaneous above, with the hemelytral markings extremely faint or absent, and the sutures and outer margin of the clavus narrowly edged with castaneous.

In the figures of the male palae, the large flattened claw is shown in various positions: this claw is hinged in a nick at the apex of the tarsus, and when folded back rests in a depression on the upper side of the joint.

*Life colours.* In parts the colours of a freshly-killed specimen rapidly alter as the insect dries; the life colouration of Adelaide specimens is as follows:

♂ Head pale, with a large, brownish-orange, sub-circular marking, within which are two U-shaped, bluish-green markings; blackly suffused at base; face cyaneous, paler centrally; eyes black. Pronotum, scutellum and hemelytra as previously described. Sternum pale, in parts greenish; xyphus green; underside of abdomen pitchy, paler posteriorly and on lateral edges; legs testaceous, in parts diaphanous; posterior half of intermediate femora sometimes pale blue.

♀ Underside of abdomen bluish-green.

The male is easily distinguishable by the pitchy abdomen.

In autumn (April and May) of 1921 this species was common in the Torrens River at Adelaide, at which time the water was at a comparatively low level; larvae and pupae (p), as well as imagos, were present in considerable numbers. In August of the same year, when the river had again somewhat subsided after the winter rains, hundreds of specimens were taken, all being fully adult. Mud adhered plentifully to the backs of very many of them, and in one instance a branched alga was attached to and growing profusely on the wing covers of the living bug. Epiphytic diatoms were associated with the alga, which was determined by Mr. L. J. Millar as a species of *Cladophora*, which has also been taken from the carapaces of Murray River tortoises. The presence of mud and living vegetation indicates that the insects are dormant during the winter. J. W. Douglas<sup>(7)</sup> observed English *Corixae* in the spring besmeared with mud, and suggests that the bugs are buried in the river-bed throughout the winter months. If, however, they merely remained inactive and clinging to weeds and stones, they would become similarly coated, for sediment would deposit evenly on the head, pronotum, and hemelytra.

#### MICRONECTA ROBUSTA sp. nov.

♂ Head greenish ochraceous, with a longitudinal, median testaceous line; hinder margin darkened and with a central, dark brown tubercle; length little more than half the width at base between eyes, rather shorter than the pronotum. Pronotum dark greyish-brown; width between humeral angles much more than twice medial length; shining, smooth, except for very faint transverse scratches; lateral margins a little oblique; angles obtuse. Scutellum testaceous. Hemelytra greyish-brown, paler at base, darkened apically; punctured; costal margins ochraceous, with two linear, blackish markings; clavus with somewhat broken



Fig. 347.

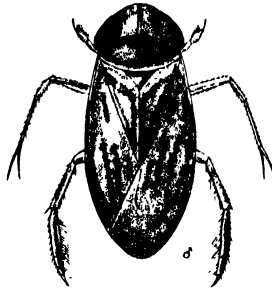
*Micronecta robusta.*

Fig. 348.

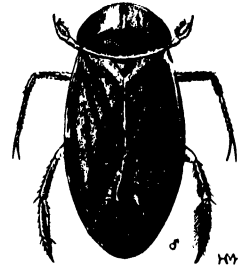
*Micronecta gracilis.*

Fig. 349.

*Micronecta virgata.*

(7) Douglas, Ent. Month. Mag., iii, 1866, p. 27.

fasciate markings, parallel to margins; claval suture edged with ochraceous; corium with three or four more or less interrupted, dark, fasciate markings; outer edge ochraceous; apex of membrane roundly angulate. Sternum and legs ochraceous; underside of abdomen testaceous; intermediate claws as long as tarsi. Length, 3.75 mm. to 4 mm.

♀ Larger and more robust. Head rather shorter and wider; face centrally testaceous. Legs and underside wholly ochraceous or with posterior coxae darkened. Length, 4 mm.

*Hab.* South Australia: Adelaide (type locality, H. M. Hale), Quorn (A. H. Elston), Murray River (H. S. Cope and F. R. Zietz), Mount Lofty Ranges (J. Formby); Western Australia: Mullewa (Miss J. F. May); New South Wales: Coolabah (W. W. Froggatt). Type, I. 15188.

The head in drying sometimes assumes a more angularly rounded appearance in front of the eyes; the longitudinal, median line may be darkened and diffused. The pronotum may be unicolorous or posteriorly margined with ochraceous. A colour variety from Mylor, Mount Lofty Ranges, is pale ashen-grey, with brown markings.

### **MICRONECTA GRACILIS sp. nov.**

♂ Head ochraceous, in parts darker; with a median, longitudinal, testaceous marking; posterior margin suffused with fuscous and with a small, central tubercle; rather long, well produced in front of eyes, about as long as the pronotum, almost as long as width at base between eyes, the inner margins of which are divergent. Pronotum dark castaneous, the posterior margin narrowly edged with paler; large, nearly twice as broad between humeral angles as medial length; shining, almost smooth, with very faint, transverse scratches; lateral margins short, oblique; angles sub-acute. Scutellum fuscous. Hemelytra pale fuscous, paler basally and on the costal edge; the last-named with three linear brown streaks; densely punctured; clavus with pale castaneous fasciate markings sub-parallel to the margins; corium with four obscure, broken, longitudinal, dark streaks. Underside ochraceous, in parts marked with fuscous; legs pale ochraceous. Length, 3.5 mm. to 4 mm.

♀ Underside ochraceous. Length, 3.5 mm. to 4 mm.

*Hab.* South Australia: Adelaide and Murray River (H. M. Hale), Quorn (type locality), and Myponga (A. H. Elston), Mount Painter, Flinders Ranges (H. G. Stokes); Queensland: Dalby (Mrs. F. H. Hobler); New South Wales: Tamworth (A. M. Lea); Victoria: Melbourne and Wattle Park, Balwyn (Searle), Coromby (J. G. O. Tepper). Type, I. 15189.

Differs from other species here described in the more slender form and comparatively long pronotum; the hemelytral markings are always broken; the pronotum is sometimes unicolorous.

Several examples from Cairns district, Queensland (A. M. Lea) are much smaller in size, all being less than 3 mm. in length; these possibly represent a local variety.

### **MICRONECTA ERATO Kirkaldy.**

*Micronecta erato* Kirk., Ent. News (Philadelphia), xvi, 1905, p. 263.

“Head and underside pale stramineous. Pronotum pale sordid yellow, with a broad blackish brown median transverse stripe, which does not reach the lateral margins. Tegmina sordid stramineous; clavus with two dark brown narrow lines running parallel to interior and corial margins, uniting at the apex of clavus. Corium with two elongate, suboval areas narrowly dark brown bordered, and the exterior lateral margins also brownish black. Pronotum, scutellum, and tegmina somewhat superficially punctured. Head rounded in front, longer than the pronotum; lateral margins of pronotum obsolescent; membrane apically angulate. Length, about 3 mm. Australia: Victoria.”

Type in author's collection.

### **MICRONECTA VIRGATA sp. nov.**

♂ Head testaceous, posterior margin with a small, central, black tubercle; short and but little produced in front of eyes, about as long as the pronotum, its length a little more than half the width at base between eyes, which are very slightly divergent. Pronotum dark brown, posteriorly narrowly margined with ochraceous; shining, about three times as wide between humeral angles as medial length; anterior margin sinuate; lateral margins short; angles obtuse. Scutellum fuscous. Hemelytra testaceous, punctured, paler basally; costal margin with a linear black marking, interrupted in the middle; two distinct, pitchy-brown fasciate lines sub-marginal to the inner and outer edges of the clavus and four longitudinal ones on the corium; membrane with some dark spots. Underside and legs testaceous. Length, 3 mm. to 3.5 mm.

♀ Head, underside, and legs ochraceous. Length, 3.5 mm. to 4 mm.

*Hab.* Queensland: Townsville (type locality, G. F. Hill), Cairns district (A. M. Lea). Type, 1. 15190.

The pronotum in some instances is not posteriorly margined with ochraceous.

### **MICRONECTA ANNAE Kirkaldy.**

*Micronecta annae* Kirk., Ent. News (Philadelphia), xvi, 1905, p. 262.

“Head pallid. Pronotum dark fuscous brown, with darker transverse



median line. Tegmina fuscous brown (the margins of the areas narrowly darker), somewhat superficially punctured. Head a little longer than the pronotum, rounded in front. Pronotum elongate elliptical, lateral margins very short, much less than half the width of the posterior margin of an eye. Mesoxypus acutely triangular. Terminal segment of antenna elongate, somewhat thickened. Intermediate femur equal in length to the tibiae, tarsus, and claw together; tarsus one-half longer than a claw, which is equal in length to the tibia. Subcostal furrow much as in *M. vanduzeei*. Length, 3½ mm. Australia."

Type in author's collection.

### MICRONECTA ANNAE Kirk., var. PALLIDA Kirk.

*Micronecta annae* Kirk., var. *pallida* Kirk., P.L.S., N.S. Wales, xxxii, 1908, p. 788.

"No transverse line on pronotum; tegmina with a pale castaneous basal band. Hab. Q.: Kuranda (Aug.; Perkins)."

The characters constituting the varietal diagnosis as given by the author are variable in some other of the species examined by me; the distinction of a "variety" on such foundation alone is somewhat doubtful.

### MICRONECTA MICRA Kirkaldy.

*Micronecta micra* Kirk., P.L.S., N.S. Wales, xxxii, 1908, p. 788.

"Pale brown, brownish-testaceous beneath; a pale castaneous band at the base of the tegmina, lateral margins with one or two dark specks. Abdomen above partly dark. Head well rounded in front of eyes, which are practically contiguous with the corium. Pronotum very short, narrower than the head, *hind margin truncate*. Length, 2 mill. Hab. Q.: Kuranda (Aug.; Perkins)."

The main distinguishing feature of this small species appears to be the short, narrow, and posteriorly truncated pronotum.

### DIAPREPOCORIS Kirkaldy.

*Diaprepocoris* Kirk., Ann. Mag. Nat. Hist. (6), xx, 1897, p. 52.

Type, *D. barycephala* Kirk.

This monotypic genus was founded upon female specimens. The palae, which are similar in both sexes, are "bisegmentate," the terminal joint having the form of a strong claw. Kirkaldy remarks that the "second segment appears to be a genuine second tarsal segment, not a single claw." The abdominal segments of the male are not disordered to the same extent as in other genera of Corixidae, and the asymmetry is not evident on the underside. The antennae are four-jointed (fig. 350a), and neither sex has a facial impression.

**DIAPREPOCORIS BARYCEPHALA Kirkaldy.**

*Diaprepocoris barycephala* Kirk., Ann. Mag. Nat. Hist. (6), xx, 1897, p. 53.

♂ Head flavous or ochraceous, a black dot often present on each side; prominent, produced in front of eyes and a little longer than its width at base between eyes; hinder margin almost evenly concave, dark testaceous centrally; face convex, with a broad, median carina; inner margins of eyes sometimes nearly parallel, sometimes considerably divergent. Pronotum testaceous or brownish-black, sometimes darkened posteriorly or anteriorly; laterally and where covered by head, pale; about four to six times as wide as long, finely rugose; anterior margin sinuate. Scutellum black, laterally testaceous; or flavescent, varyingly stained with testaceous or black; longer than wide, about as long as head and pronotum together. Hemelytra sordid yellow, in parts infuscated; embolium wholly luteous or black on inner half. Scutellum and hemelytra clothed with short, black pubescence. Posterior dorsal segments of abdomen slightly asymmetric, with a comparatively large stridulatory apparatus to the right of the midline of the body (s); stridulator brownish-black, basally overlapped by the

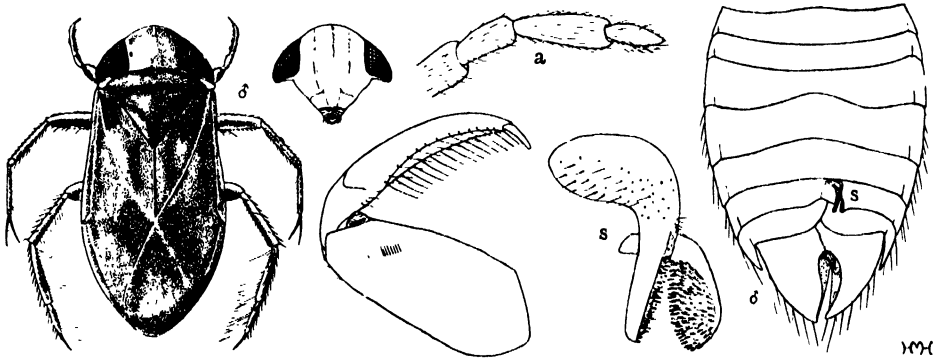


Fig. 350. *Diaprepocoris barycephala*.

fifth segment; stridulatory area black, situated on the sixth segment. Legs pale testaceous or flavous; palae sub-lunate, second joint very short, sub-cylindrical, slightly curved and tapering, rounded at the apex; anterior tibiae closely embracing base of palae; intermediate tibiae a little longer than tarsi; claws shorter. Length, 7 mm. to 7.5 mm.

♀ More robust than the male. Length, (6.2 mm.) to 8 mm.

*Hab.* South Australia: Adelaide (A. H. Elston and H. M. Hale), Lucindale (B. A. Feuerheerdt), Lake Alexandrina and Goolwa (A. Zietz), Murray Bridge (F. R. Zietz); "Victoria" and "Tasmania" (British Museum).

The colour is variable, some specimens being pale, while in others the infus-

cation is so marked that the insects appear almost uniformly dull black above; the wing-covers are semi-transparent, and the dark appearance is largely due to the nigrescent upper-surface of the abdomen, jet black in mature adults. Sometimes the whole underside, including the coxae, is black, only the face and other leg-joints being yellow.

There seems to be little doubt that the abdominal attachments referred to constitute a stridulatory apparatus. There are two hard, chitinous parts, a movable agent or stridulator, and a passive toothed area which is fixed to the sixth segment. The base of the stridulator is much expanded and flattened, forming a large lateral lobe. This is attached to the membrane beneath the fifth segment, which more or less covers the lobe, but is not connected with it. The free portion is almost straight, sub-cylindrical, and rounded apically; the right side is somewhat flattened and furnished with long, blunt, and slightly curved pegs, as is also the sub-circular stridulatory area immediately opposite; in the figure both surfaces are shown turned a little towards the observer.

It is not yet known whether these parts are operated while the insect is submerged or only when the wings are spread.

The smaller measurement of the female (6.2 mm.) is that given by Kirkaldy; the specimens examined by him may have included both sexes, but the male may not have been recognized, as the ventral segments of the abdomen differ but slightly.

## AN ABORIGINAL GIRDLE.

By EDGAR R. WAITE, F.L.S., C.M.Z.S., DIRECTOR, S.A. MUSEUM.

Plate v and Text fig. 351.

THE native girdle is the property of Mr. Norman Napier Birks, and I am indebted to him for permission to describe it. It was obtained from "Northern Queensland," but further information is not available.

The girdle is 2590 mm. or 8½ ft. in length, and probably encircled the waist of a native three times. It is formed of the cocoons of a moth, strung on sinnet, 160 cocoons having been used. The cocoons are characteristic of those of a moth of the Family Bombycidae, and probably belong to a species of the genus *Pinara*; Mr. Arthur M. Lea, our Entomologist, says that in the absence of the moth it is not possible to more specifically identify the cocoon. As is usual with members of the genus, the cocoons were built on to small twigs; on tearing them off a scar has been left and, in some cases, a portion of the twig still adheres; in stringing the cocoons the native has been careful to so pierce them that the scar or twig faces sideways, the appearance from back or front of the girdle not therefore being marred.

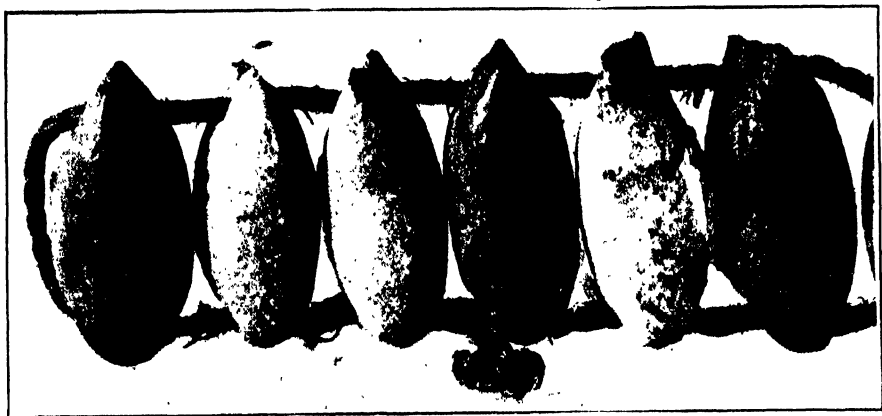


Fig. 351. Cocoons, natural size.

Each cocoon is about 40 mm. in length and 18 mm. in width; the open ends, or those from which the moth has emerged, have been squeezed, doubtless while the cocoon was fresh, and it is to be noticed that the squeezing has in all cases been done with the thumb or finger on the scar-bearing side; when strung, therefore, the flattened opening lies across the axis of the girdle.

The cocoons are pierced with two holes from the scarred side, close to each end, the piercing having been done right through both walls. They are threaded on two-ply sinnet, which is returned through the last cocoon without joining. All the cocoons are strung facing the same direction, or, as we might say, right end up.

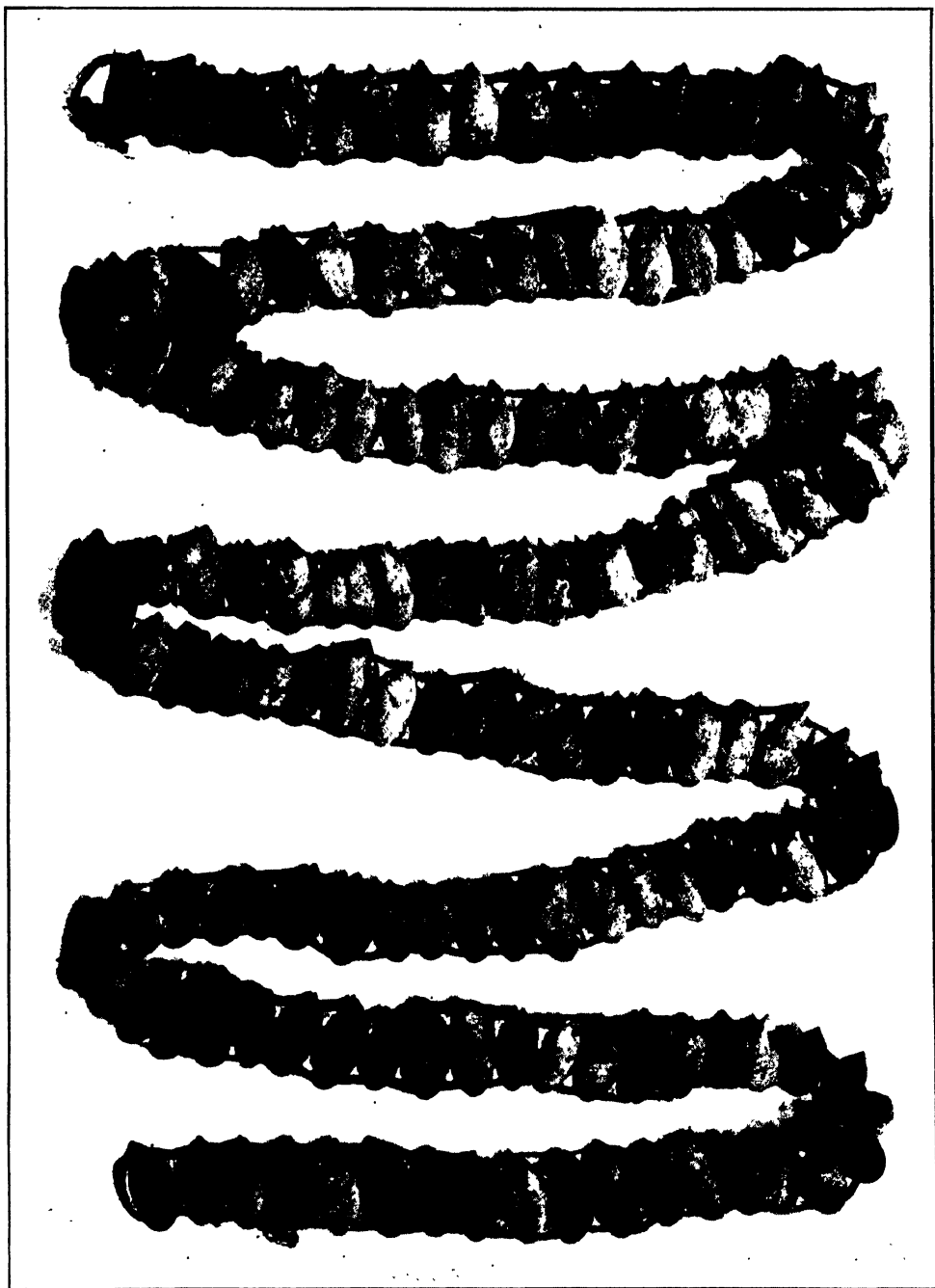
Each cocoon contains a half-thimble full of coarse gravel, and it is for the retention of this that the open ends have been squeezed and the lips kept in contact until the cocoons dried and hardened; how this was accomplished is not apparent or known.

When the girdle is shaken the gravel rattles within the dried cocoons, and there can be no doubt that it was worn in dancing.

Some of the cocoons are light grey in colour, others are brown, a distinction shown in the photograph (pl. v), which represents the entire girdle, the pinched ends of the cocoons being upwards. Fig. 351 shows the last six cocoons with the returning sinnet, the fifth last cocoon shows portion of the adherent twig.

#### **Explanation of Plate v.**

An aboriginal girdle from Northern Queensland, made of cocoons of a Bombycid moth.



*AN ABORIGINAL GIRDLE*



## THE MARSUPIAL GENUS THALACOMYS.

### A REVIEW OF THE RABBIT-BANDICOOTS; WITH THE DESCRIPTION OF A NEW SPECIES.

By FREDERIC WOOD JONES, D.Sc., Hon. Curator in Anthropology.

Text figs. 352-360.

THE rabbit bandicoots, rabbit rats, or native rabbits, constitute a very well-defined and extremely interesting little group of the syndactylous polyprotodonts.

At the present time it cannot be said that any species is at all common; but within the last twenty years certain of them have been quite abundant in suitable country, even in the immediate proximity of such towns as Adelaide. Both to the north and to the south of the city itself rabbit bandicoots lived in abundance but little more than twenty years ago, but to-day the animal is completely exterminated in practically all its old haunts. Pelts still come in small numbers to the skin salerooms, but formerly the beautifully silky skins were regular items in the markets of Adelaide.



Fig. 352. *Thalacomys lagotis*. Male specimen from Nalpa, South Australia, in the South Australian Museum. About one-sixth natural size.

In South Australia the animals were usually known as "pinkies," or in some districts as "pintoes." It is said that the name "pinkie" was given to the members of the genus *Thalacomys* in allusion to the naked flesh-coloured snout; but the same name is also used to designate the Short-nosed Bandicoot (*Isodon obesulus*) in certain parts of South Australia. In the Centre, rabbit bandicoots are usually known as "thulkas" or "talkies," which is the white man's rendering



of the name in general use among the Kukata blacks. Further into Western Australia the name changes to "dalgheites," "dalgites," or "dulgites." All these names are, however, somewhat local in their usage. The most general term, by which the animals seem to have been known to the colonists in all the States, is "bilby."

Unfortunately the rabbit bandicoots are not only rare animals to-day, but, as is the case with so many forms that were common enough only twenty years ago, the amount of preserved material existing in Australian Museums is sadly inadequate. To provide descriptions based on the examination of a thoroughly satisfactory series of skins and skulls would be a very difficult task for the **worker** in Australia. In the modern study of **Mammalogy** it is becoming increasingly important that the characters of a species should be determined from the examination of a large number of individuals, the provenience of which individuals should be precisely known. It cannot be said that the Australian Mammals, even the commonest species, are represented in sufficiently long series in Australian institutions to make work, in keeping with modern requirements, at all easy to carry out in Australia.

In some respects, therefore, this paper must be regarded as being merely tentative, for I am fully aware that the material I have been able to examine has been too limited in amount to make my conclusions as absolute as is desirable in studies of this kind. It is possible that the accumulation of further specimens may invalidate some of the deductions here put forward; for the variability of animals whose habitat is in the more central Australian regions is well recognized. The variability in adult size of animals living in the Centre is a very remarkable phenomenon, and some of the species of the genus *Thalacomys* have been established largely upon the size of the animal. It has therefore been my aim to sort out certain cranial features which serve to distinguish the known species, and so avoid so far as possible attaching importance to features which are well known to be unstable in the environment in which these animals live. In this way it is hoped that the necessarily small amount of material examined is compensated for, and meanwhile this paper may serve its purpose by providing a basis for future workers by gathering together the descriptions of all the known species within the compass of a single short article, and by providing figures of the main features of their cranial architecture.

In general, the bionomics of all the species may be taken as being similar, and in the following notes the individual species will not be differentiated unless it is known that their habits differ in some respects. Observations on wild specimens mostly relate to *T. sagitta*; whilst those observed in captivity have been *T. lagotis*, and the new species *T. nigripes*.

By the earlier colonists the bilby was not only regarded as an animal against which the methods of the exterminator need not be employed, it was even accorded a certain amount of protection and was, at times, kept as a pet about the house. The tolerance with which it was regarded by people whose hands may justly be said to have been against all animals was due to the fact that it

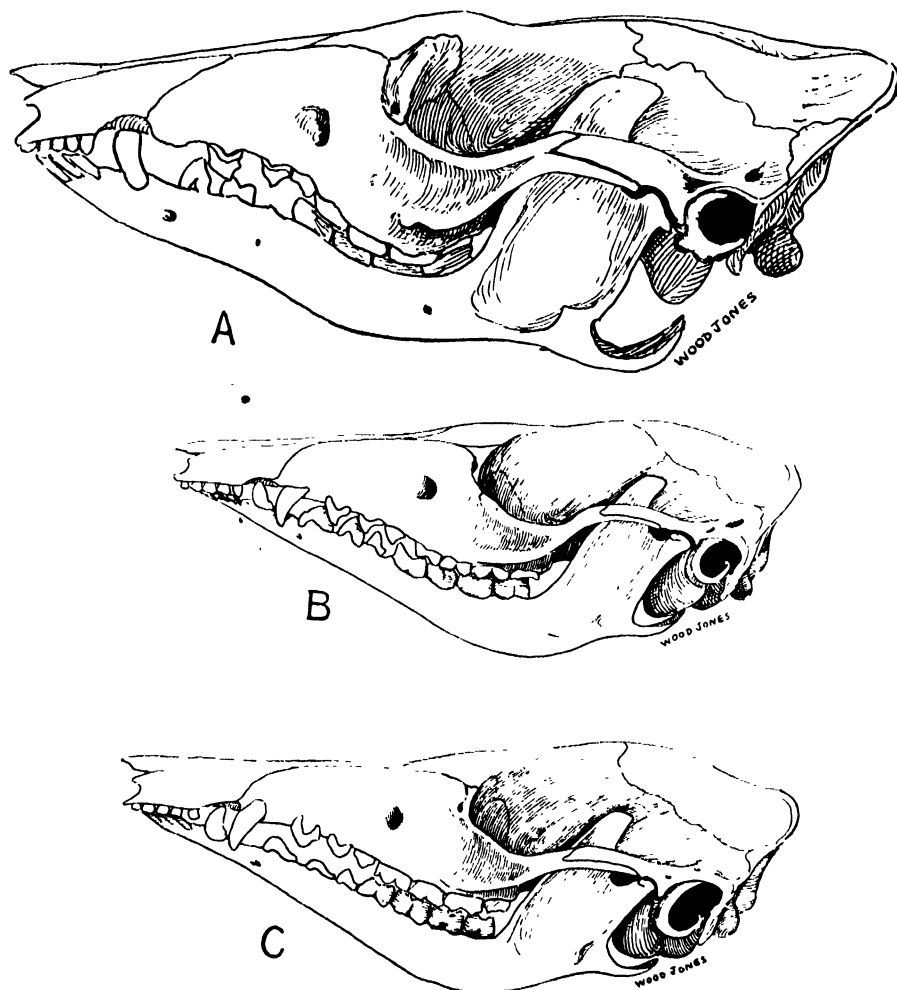


Fig. 353. Lateral views of skulls. (A) *T. lagotis*, from Nalpa. (B) *T. sagitta*, S.A. Mus., No. M1622. (C) *T. nigripes*, from Ooldea. All natural size.

was recognized early that, in the destruction of mice and insects, the rabbit bandicoots were extremely useful creatures. Unfortunately, this regard for the animals seems to have been forgotten by a later generation, and in more recent days but little mercy has been shown to them by any section of the community.

The diet of the bilby is commonly said to be "bulbous roots" (Kreff), "grass, fruits, and insects" (Lydekker), but I doubt very much if any of the species is at all given to eating roots, grass, or fruits. It is true that in districts where they live it is common to see little holes scratched around the roots of vegetation, but it is very doubtful if these are made in order to obtain roots. It seems much more likely that insects are the object of the search. In captivity I have been unable to persuade them to eat roots or fruit; but bread or cake, meat raw or cooked, insects, snails, birds, and mice are all readily eaten. Those that I have observed are far more carnivorous than any of the bandicoots (*Isodon* or *Perameles*) that I have had living in captivity.

The members of the genus *Thalacomys* differ from the rest of the *Peramelidae* in their truly fossorial mode of life. *Isodon* and *Perameles* will both scratch out shallow runways, but none of the species with which I am acquainted ever excavates real burrows in which to live. *Thalacomys*, on the other hand, passes most of its time in the depths of a burrow of its own making. These burrows are still to be seen in some numbers in certain districts to the north of the Transcontinental Railway from Port Augusta to Perth. The typical burrow, as it is excavated in this district, is easily identified, not only by the track of the animal and the characteristic mark made by its tail, but by the actual construction of the burrow itself. Unlike many burrowing animals, it does not make an exit and an entrance hole. The burrow has a single opening, and from the mouth it descends with a fairly steep but ever-opening spiral to a depth of five feet or more. The spiral construction seems to be universal, and the work involved in digging out a burrow is very considerable, for the animal by no means always selects those spots where the soil is loose, as Waterhouse affirms (p. 361). According to Sir Baldwin Spencer, *T. minor* differs from the other members of the genus in that "during the winter months it lies within a foot or so of the entrance of its burrow and only uses the inner chamber during the summer" (p. 9). *T. sagitta*, *T. nigripes*, and *T. lagatis* seem to occupy the furthest recess of the burrow at all times, and have to be dug out, whereas the blacks capture *T. minor* by stamping in the burrow behind it. Not only does *T. sagitta* spend the whole day at the bottom of its burrow, but in the region to the south and west of Lake Eyre, where alone I have field experience of it, it spends the whole of the cold weather, for it never comes abroad in the evenings of the short but sharp winter.

It is a feature not confined to the burrows of *Thalacomys*, for the homes of many creatures which live underground in the arid Centre show the same characteristic—that, though maybe a barrow load of earth must have been

removed in the excavation, the mound of débris at the entrance consists of no more than a bucketful.

By Krefft it is said not to be so ferocious as its large canines would lead one to suspect. To a certain extent that is true, and the animal can only be described as an extremely inoffensive creature. Nevertheless, all those with which I have had to deal have needed the exercise of considerable caution in their handling. They bite readily and savagely when interfered with, and though the bite may not be very severe, it is aggravated by the fact that the animal will not readily let go, and inflicts multiple bites from a single hold. Bilbies are strictly nocturnal, and come abroad at a later hour than any other marsupials that I have observed. Those that I have had living in captivity (in a large open-air run) have often been noticed to appear at dusk, but, after a hurried look round, to retreat to bed again, and not reappear for an hour or so. They seem, however, to have no objection to moonlight. During the daytime they sleep in a remarkable posture. No bilby that I have observed—even including one that had lost a hind leg in a rabbit trap—ever really lay down to sleep. The long ears are laid back, and then folded forwards against the side of the head, so that the tips come forward over the eyes, and alongside the snout. The animal then squats on its hind legs, and tucks its long snout between its fore legs, so making itself into a round silky ball, the tail being protruded straight behind it or flexed forwards right underneath the body. When the animal wakes in the evening it often starts its perambulation with one ear laid back and the other still doubled forwards in the sleeping position. It is curious that, though the ears are kinked flat upon themselves for the greater part of the time, there is no indication in them of a crease or folding line where the flexure takes place.

In any gait the hind limbs move together. In slow progression the fore limbs move alternately; in more rapid movements they move in unison, but alternately with the synchronously acting hind limbs. Waterhouse noted of one which lived in the gardens of the Zoological Society of London that, "when walking, the hind legs only were used, and these were very widely separated. The tail assisted slightly in supporting the body, which was but little raised in front" (p. 361). I cannot help thinking that this is an erroneous observation. It is quite true that the hind legs are widely separated, and that the body is but little raised in front; but I do not think that the animal ever progresses on its hind legs alone in true saltatory fashion.

It can make a good pace, though its progress always appears to be shuffling and somewhat ungainly. Its greatest safeguard is its aptitude for digging itself in, and the speed with which it can make for the shelter of its burrow.

In almost all published figures, and in most mounted specimens, the animal

is represented as standing far too high on its legs: such figures as Lydekker's Plate xx, and the mounted specimen photographed by Lucas and Le Souëf (fig. p. 137), give very incorrect postures for the animal. Compare figs. 352 and 358.

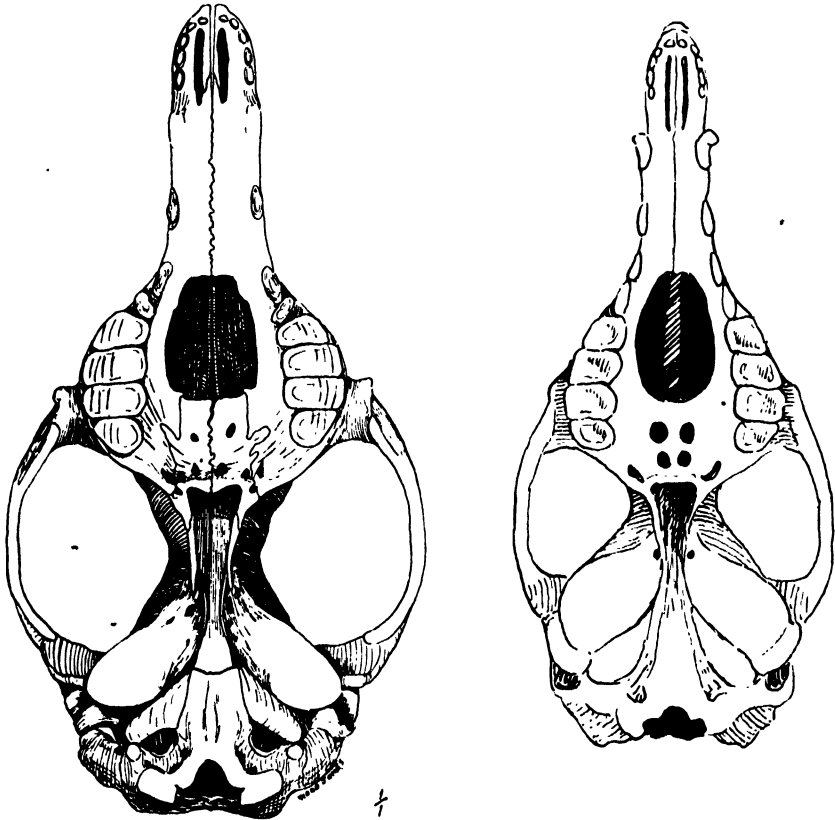


Fig. 354. Basal views of skulls of *T. lagotis*. Figure on the left from a male specimen from Nalpa, South Australia. Figure on the right from Thomas, Cat. Brit. Mus., 1888, pl. xxii, fig. 1. Natural size.

The toilet of the long silky hair is elaborate, and is performed, as usual, by the syndaetylous pedal digits, the manus being unemployed. An animal which had suffered the loss of a hind leg made vigorous attempts to scratch itself with the short stump, but never attempted to replace the office of the absent member by the employment of its hands. The syndaetylous digits, after being employed for combing, are invariably cleansed by the teeth and tongue. The change of pelage takes place twice a year, in September and in February, and is a prolonged affair. The new coat first appears upon the head, and slowly spreads over the shoulders and along the back. There is a very sharp line of division between the

old coat and the new, for the new hairs remain for a long while considerably shorter than the old, and they are distinctly more warmly coloured, the old coat appearing long and silvery, the new coat short and more fawn coloured.

The main guiding sense for food is olfactory, and, during daylight at least, the power of vision seems to be by no means acute. A grasshopper, even though it be actively moving, is detected in the daytime by scent before it is detected by sight. When active in the dark the auditory sense is evidently very keen, and although the animal will take no notice of a person who remains quite still, it will detect a footfall with remarkable discrimination.

The animal appears to produce no vocal sound save an inspiratory hiss when disturbed.

The reason for the rapid decrease in numbers of the bilbies is not obvious. Certainly they have been ruthlessly slaughtered in all districts within reach of the more settled areas. Their pelts have been marketed in large numbers for profit, and they have been more wantonly killed for "sport." Many have been maimed or killed in rabbit traps, and possibly many have fallen victims to poison baits. As with all the more defenceless marsupials, the introduced fox has probably played its sinister part. But in the Centre, where the fox is still absent or rare, it would seem that the extraordinary abundance of rabbits, and the consequent shortage of breeding burrows, has been a very real factor. It may be useless to plead for the preservation of the remnant of the bilbies, but at least it is worth urging that the sale of their pelts should be totally prohibited.

### THALACOMYS Blyth.

*Macrotis* Reid, Proc. Zool. Soc., 1836, p. 131.

*Thalacomys* Blyth, Cuv. Anim. Kingd., 1840, p. 104; Thomas, Ann. Mag. Nat. Hist. (7), v, 1900, p. 223; Elliot. Publ. Field. Col. Mus. Zool., vii, p. 10, 1907.

*Peragalia* (*Peragalea*) Gray, 1843. By Thomas, Lydekker and Cabrera the reference is given as Grey's Australia, App. II, p. 401. Assuming this reference applies to Grey's "Travels in North-West and Western Australia," 1841, it is incorrect, as there the animal is listed as *Perameles lagotis*. By Cabrera the reference is also given for *Macrotis*, but no mention of this synonym occurs in this work. The reference should be Gray, Hist. Mamm. Brit. Mus., 1843, p. 96.

**Type.** *Macrotis lagotis* Reid.

The distinguishing characters of the genus may be summed up as follows: General form light and delicate. Pelage remarkably long and silky. Muzzle long and pointed, usually naked for a space upon its dorsal surface posterior to

the rhinarium. Rhinarium narrow; naked; grooved only slightly in its infra-narial portion. Ears extremely long, naked, and membranous towards their extremities; funnel-shaped with a tubular base, processus antehelicis duplicated. Pouch opening downwards and slightly backwards. Nipples 8 (9 in the original description of Reid). Manus with 5 digits, the 1st and 5th short and clawless; the 2nd, 3rd, and 4th well developed and armed with strong curved claws. Hind limbs much longer than fore limbs. On the pes, the hallux is absent; the 2nd and 3rd digits syndactylous; the 4th and 5th well developed, the 4th being by far the largest. See fig. 360.

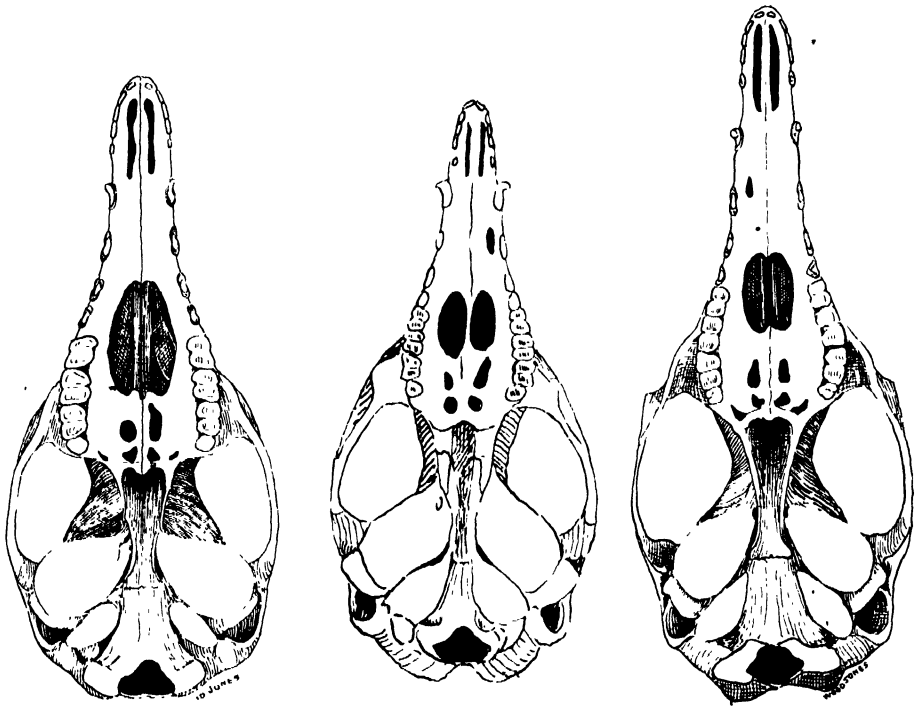


Fig. 355. Basal view of skulls. Figure on the left *T. sagitta*. Central figure *T. minor* (from Spencer). Figure on the right *T. nigripes*.

Digital formula of manus:  $3 > 2 > 4 > 5 > 1$ ; palm granular, three small interdigital tubercles at the bases of digits 2, 3, and 4.

Digital formula of pes:  $4 > 5 > 2,3$ ; sole hairy, with exception of heel, pad, and terminal portions of digits. One large pad at base of digit 4. Tail long, crested in its terminal portion.

**Skull.** Facial portion of skull abruptly contracted to snout region opposite the 2nd premolar. Palate large, the vacuities usually conjoined. Bullae very

large and pyriform; mastoid inflation well developed. Dentition:  $I \frac{3}{3}$ ;  $C \frac{1}{1}$ ;  $P.M. \frac{3}{3}$ ;  $M \frac{1}{1}$ . Upper incisors broad and flat,  $I^5$  being close to  $I^4$ . Canines large and powerful. The last premolar distinctly smaller than the tooth immediately in front of it. Molars square or rounded in section.

The genus appears to be obviously a specialized offshoot of the Australian bandicoots, which themselves find their more primitive representatives among the Papuan members of the genus *Peroryctes*.

### THALACOMYS LAGOTIS Reid.

*Perameles (Macrotis) lagotis* Reid, P.Z.S., 1836, p. 129.

*Peragale lagotis* Thomas, Cat. Mars. & Mon. Brit. Mus., 1888, p. 223, pl. xxii, fig. 1; Flower & Lydek., Mamm., 1891, p. 143; Ogilby, Cat. Aust. Mamm., 1892, p. 24; Lydek., Mars. & Mon., 1894, p. 132; Spencer, Horn. Exp., ii, 1896, p. 17; Lucas & Le Souëf, Anim. of Aust., 1909, p. 137.

*Thalacomys lagotis* Elliot, Pub. Field Col. Mus., Zool., vii, 1907, p. 10; Cabrera, Gen. Mamm. Mon. & Mars., 1919, p. 82.

The external characters as originally recorded by Reid (Proc. Zool. Soc., 1836, p. 129) are as follows:

"*Perameles lagotis*. Per. griseus, capite, nucha, et dorso, castaneo lavatis; buccis, lateribus colli, scapulis, lateribus, femoribus extus, caudaque ad basin, palide castaneis; mento, gula, pectore, abdomine, extremitatibus intus anticeque, antibrachiis postice, pedibus que supra albidis, antibrachiis externe pallide griseis, femoribus extis posticeque saturate plumbeis; cauda, pilis longis albescens ad partem basalem, induta, dein pilis nigris tecta, parte apicali alba, pilis longis supra ornata. Vellere longo molli. Cauda pilis rudis vestita; pilis ad pedes brevissimus. Labio superiore, buccisque, mystacibus longis sparsis. Auriculis longis, ovatis, intus nudis, extus pilis brevissimis brunnis, ad marginem, albescens indutis, pilis ad bases eos plumbeis, apicalis albis aut castaneis, illis in abdomine omnino albis. Marsupio ventrali magno, mammis novem, in faciem posticam; quarum una centralis est, reliquis circumdata, intervalis aequalibus, gyrumque facientibus, transversum unciam cum quadrante redentem."

The more extended descriptions that are given by Waterhouse and by Thomas are in practical agreement on most points, and the general specific characters of *T. lagotis* may be summed up as follows:

**External Characters.** Size large, head and body length being 400 mm. and upwards. General body colour fawn-grey, with ventral surface and inner aspect of limbs white. A faint indication of paler bands across the thigh is present in some specimens. Manus white. Pes white above; dark below in



the posterior half, or rather more. Tail with the black portion as long as, or longer than, the white portion.

**Cranial Characters.** Skull large; basal length 90 mm. or more. All muscular ridges and crests extremely well marked. The posterior (molar) portion of the palate distinctly rounded in outline; the molars arranged in crescentic series. The posterior end of the palate extending well behind the last molar teeth. The posterior palatine vacuities reach from about the central point of the middle premolar to about the central point of the third molar. The nasal bones extend backwards so that their posterior ends almost reach a line joining the lachrymal foramina. See figs. 353, 354, 356, and 357.

**Dental Characters.** Molars large. Intervals between the ligual margins of adjacent teeth very small. From the front of the canine to the back of  $M^1$  is a distance of 42 mm. or more.

**Distribution.** The type specimen was described as coming from "Van Diemen's Land," but this was in error, the animal having been procured in the Swan River district of Western Australia.

The species still exists in Western Australia.

In South Australia, though it was formerly abundant in the southern portion of the State, it is now either extinct or on the verge of extinction.

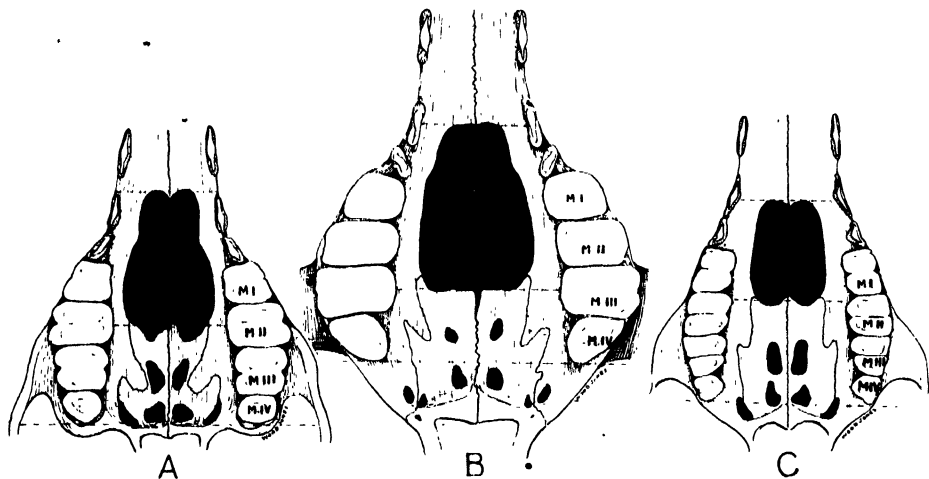


Fig. 356. The posterior portion of the palate in (A) *T. sagitta*, (B) *T. lagotis*, (C) *T. nigripes*.

Recently, owing to the kindness of Mr. Heber Longman, I have had the opportunity of examining a typical living specimen from Queensland.

It must not be imagined that *T. lagotis* is the representative of the genus in Western Australia, and that *T. sagitta* is the representative in South Australia, an impression which is rather easily gained from Thomas's 1905 paper; for

*T. lagotis* was the prevailing type in the southern portion of South Australia only a comparatively short time ago. Thirty years ago it was usual for rabbit trappers in the Southern districts to take more bilbies of this type than rabbits in their traps. Of this race, one very fine mounted specimen,\* some half-dozen skulls, and a fully articulated skeleton are preserved in the South Australian Museum. The Museum material is mostly from Nalpa, and this for the reason that the country about Lake Alexandrina was the family property of the late Sir Edward Stirling (at one time Director of the Museum). From Nalpa the animal has long since disappeared. See fig. 352.

#### Dimensions in mm.

	Brit. Mus. ad. ♂ stuffed, W.A.	Reid. Type.	Waterhouse.	ad. ♂ stuffed. Nalpa, S.A.
Head and body . . . . .	440	462	458	550
Tail . . . . .	220	254	244	260
Hind foot . . . . .	98	113	101	114
Fore foot . . . . .	—	44	—	—
Ear . . . . .	90	97	96	77
Rhinarium to eye . . . . .	61	71	—	72

#### Dimensions of Skull.

	Nalpa.	Nalpa.	Nalpa.	Gilles Plains.	Western Aust.	Brit. Mus. W.A.	Brit. Mus. W.A.
Greatest length . .	114	114	110	105	104	—	—
Basal length . . .	103	104	105	96	94	94	92
Zygomatic breadth .	55	56	55	55	44	50	42
Nasals, length . .	50	48	47	49	47	47	46
Palate, length . .	64.5	66	66	64	62	61.5	61
C-M <sup>1</sup> . . . . .	45	44	43	43	45	44	42.5

#### THALACOMYS SAGITTA Oldfield Thomas, 1905.

*Thalacomys sagitta* Thos., Ann. Mag. Nat. Hist. (7), xvi, 1905, p. 426; Cabrera, Gen. Mamm., Mon. & Mars., 1919, p. 82.

In his paper of 1905 Mr. Oldfield Thomas decided, on the receipt of a specimen from Killalpaninna (wrongly spelled as Killalpanima), that the South Australian animal was so considerably smaller than the West Australian one that the two ought certainly to be separated. It may be pointed out that the district around the old mission station of Killalpaninna, which lies in the arid Lake Eyre basin of Cooper's Creek, can hardly be taken as a typical South

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\* A large specimen, but indifferently mounted, many years ago.—[Ed.]

Australian habitat. It is, therefore, not at all unlikely that the animal which was forwarded by Mr. Hillier does not represent the South Australian animal when we consider South Australia as a whole. The type *T. sagitta* should be regarded as a northern form, one which lives in the region of the Lake Eyre basin, probably from somewhere near Miller's Creek, in the S. and W. to Cooper's Creek in the N. and E., and Charlotte Waters in the N. *T. lagotis* is the form which had for its habitat the more watered and more fertile districts of the southern portion of South Australia. *T. sagitta* is the representative of the genus in the more arid central regions. Of the external characters, Oldfield Thomas says: "Externally, apart from the corresponding difference in size, there is little to distinguish the two forms. On the whole *T. sagitta* is a little paler in tone, the black band on the tail is slightly shorter, being shorter instead of longer than the white end, and the feet are paler below, the black only extending about a third of their length underneath the heel."

The general specific characters of *T. sagitta* may be summed up as follows:

**External Characters.** Size medium, head and body length being about 300 mm. and upwards. General body colour as in *T. lagotis*, but a little paler. Manus white. Pes white above; dark below in the posterior third only. Tail with the black portion shorter than the white portion.

**Cranial Characters.** Skull fairly large; basal length 70 mm. or more. Muscular crests not very well developed. The posterior (molar) portion of the palate only very slightly rounded in outline; the molars arranged in almost straight rows, which diverge posteriorly. The posterior end of the palate terminates at the last molar tooth. The posterior palatine vacuities reach from about the central point of the middle premolar to about the central point of the second molar. The nasal bones extend backwards so that their posterior ends come to within about 4 mm. of the line joining the lachrymal foramina. See figs. 353, 355, 356, and 357.

**Dental Characters.** Molars relatively large. But little space between the lingual margins of adjacent teeth. From the front of the canine to the back of  $M^4$  is a distance of 36 mm., or slightly more.

Of *T. sagitta*, Oldfield Thomas reports that there are five skulls in the British Museum; a good example (No. M. 1622) is in the South Australian Museum, and I have some others, all obtained from the desiccated remains of animals long dead and often fragmentary, at Miller's Creek and at Coward Springs.

According to Mr. Hillier, the Diari name (Cooper's Creek) is "Kapita," and, as Oldfield Thomas points out, it is almost certainly the "Urgarta" of the Charlotte Waters blacks. It is also probably the "Thulka" of the Kükata.

**Dimensions** (measured in the flesh) by Mr. Hillier, who obtained the type specimen). Adult male:

Head and body . . . .	316 mm.	Hind foot . . . . .	91 mm.
Tail . . . . .	215 mm.	Ear . . . . .	79 mm.

**Dimensions of Skull.**

	Type.	Coward, F. W. J.	S.A. Mus. No. 1622.
Greatest length . . . . .	85	—	82
Basal length . . . . .	76.5	—	74
Greatest breadth . . . . .	38	35	35
Nasals, length . . . . .	40	37	38
Palate, length . . . . .	50	49	50
Front of C to back of M <sup>1</sup> . . . . .	36	36	37

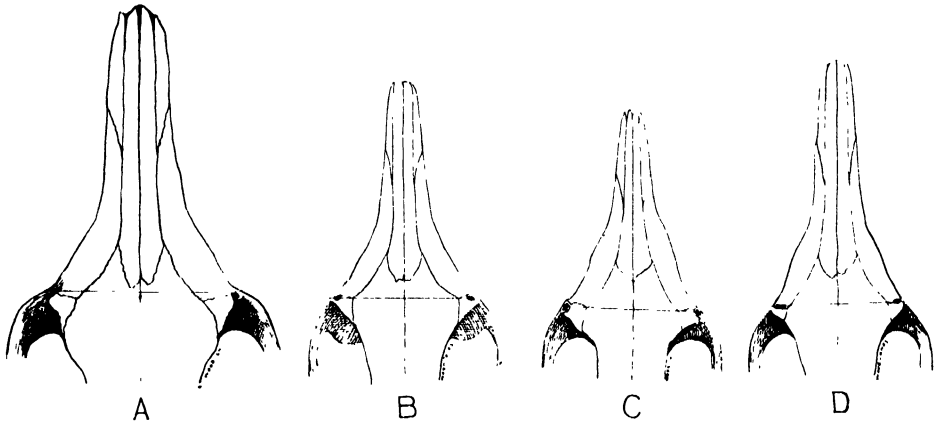


Fig. 357. The posterior extension of the nasal bones in (A) *T. lagotis*, (B) *T. sagitta*, (C) *T. minor*, (D) *T. nigripes*.

**THALACOMYS MINOR** Baldwin Spencer, 1897.

*Peragale minor* Spencer, Proc. Roy. Soc. Vict., ix, 1897 (New Ser.), p. 6, pl. ii, fig. 14.

*Thalacomys minor* Cabrera, Gen. Mamm., 1919, p. 82.

The description of the external characters of the type is as follows:

"Size considerably smaller than *T. lagotis*. Fur very long, soft and silky; composed almost entirely of under-fur. General colour fawn-grey, but darker than in *T. lagotis*. Head long, muzzle narrow. Rhinarium naked at the tip of the snout, but no backward prolongation of the naked part as in *T. lagotis*. Face grey-brown, the under-fur of the face grey basally, then fawn coloured with a dark tip, the longer hairs with a longer black tip. On the dorsal surface and sides of the body the under-fur is black basally, then fawn coloured. The longer

hairs very little longer than the under-fur, with a black tip. The hairs of the under-fur very often have a dark-brown tip. Chin and inner side of fore limbs white, the rest of the limbs and under-surface grey, the fur with a dark-grey basal part and white distal half. Hands white. Hind feet white above, hairy beneath, the hairs on the posterior two-thirds black, the anterior third white. Tail with the proximal two-thirds short haired. Along the dorsal line is a sharply marked narrow band of dark hair, increasing in length distally. At one-third of the length from the posterior end the black hairs stop abruptly, and are succeeded by a dorsal series of white hairs, forming a distinct crest, the hairs of which are proportionately shorter than in *T. lagotis*. Sides and under-surface of the tail with scanty stiff white hairs. Two small round pads at the base of the fourth and fifth toes. A few long whisker-like hairs on the posterior side of the fore limb, just above the wrist, the longest measuring about 40 mm. Mammae 8. Two or three young ones apparently produced at one time."

Of *T. minor* I have examined no specimen, and therefore rely wholly on Spencer's description. From this description the specific characters may be summarized as follows:

**External Characters.** Size small, head and body length being 200 mm. and upwards. General body colour as in *T. lagotis*, but somewhat darker. Manus white. Pes white above; dark in the posterior two-thirds below. Tail with the black portion longer than the white portion.

**Cranial Characters.** Skull small; basal length 60 mm. or more. Musculocrests and ridges very feebly marked, the skull being light and delicate in build. Posterior (molar) portion of the palate slightly rounded. Molars in slightly curved rows. The posterior end of the palate extends well behind the last molar tooth. Posterior palatine vacuities from about the central point of the middle premolar to the second molar (in figure) or to the third molar (in description). The nasal bones at their posterior ends fall short of the line joining the lachrymal foramina by about 5 mm. See figs. 355 and 357.

**Dental Characters.** Molars small. Considerable spaces between the lingual margins of adjacent teeth. From the point of the canine to the back of  $M^4$  is a distance of 28 mm.

The type specimens came from the sandhills about forty miles to the north east of Charlotte Waters, in Northern Territory. The native name is "Urpila."

#### Dimensions.

	Adult ♀	Adult ♀	Adult ♂	Adult ♀	Adult ♂
Head and body . . . . .	215	200	245	240	270
Tail . . . . .	124	118	127	152	160
Ear . . . . .	71	68	87	85	92
Muzzle to eye . . . . .	31.5	21	37	39	41

**Dimensions of Skull.**

	Adult ♂	
Greatest length . . . . .	—	Nasals, length . . . . . 32
Basal length . . . . .	66	Palate, length . . . . . 41
Zygomatic breadth . . . . .	34	C <sup>1</sup> —M <sup>4</sup> . . . . . 28

**THALACOMYS NIGRIPES** sp. nov.

The animal is almost the same size as *T. sagitta*, and therefore smaller than *T. lagotis* and larger than *T. minor*. In general colour it is much as *T. lagotis*, being darker and more fawn coloured immediately after the moult, and lighter and more silvery immediately before it. The general body colour becomes darker upon the dorsal surface towards the hind end of the body; the tips of the long hairs of the posterior end of the body being black. At the immediate base of the tail the dark hairs give way to rather bright fawn-coloured ones over a distance of about 30 mm. The naked rhinarium is flesh coloured, grooved upon its labial portion, and extending backwards dorsally for about 20 mm. Face fawn

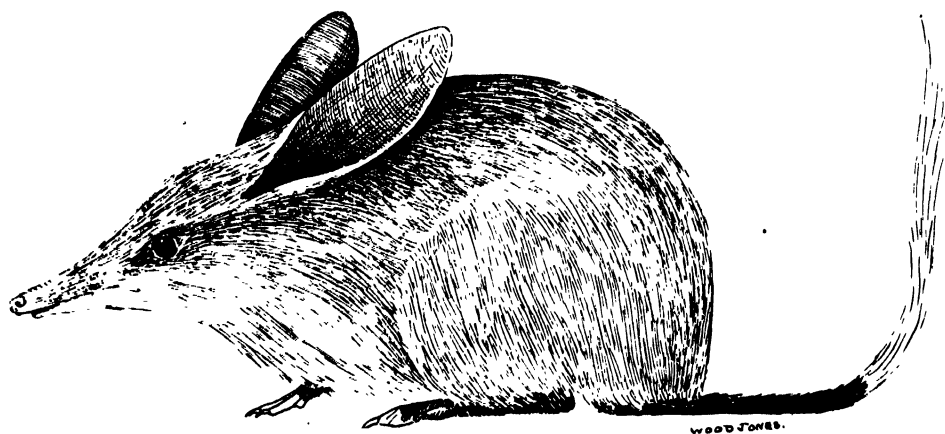


Fig. 358. *T. nigripes*. From a living male specimen. The terminal portion of the tail is represented erect merely for compactness in reproduction. About one-third natural size.

coloured. The dorsal surface of the snout, immediately behind the naked rhinarium, and as far back as the middle of the eye, is black. Fine black hairs also surround the eye. Sides of the body more fawn coloured than the dorsal surface. Chin, throat, and ventral surface pure white. The hair is directed uniformly backwards on the body, save that there is a reversed gular tract, as in the bandicoots. Fore limb dark as a whole upon its outer and dorsal aspects; white on the inner and ventral side. The proximal (humeral) portion dark grey, increasingly dark as it is traced downwards; the forearm, wrist, and dorsum of the

manus black. The black hairs stop abruptly over the metacarpus, the digits themselves being white. Just above the wrist the white of the inner aspect of the forearm trespasses on to the dorsal surface, making a prominent white patch, about 15 mm. in diameter, on the lower part of the forearm. The hind limb dark grey in the whole of its diameter in the tibial portion, save for a narrow strip of white on the dorsal (anterior) aspect. From the ankle onwards the pes is entirely black, both above and below, save for the presence of a few white hairs over a space of about 5 mm. at the base of the nail of the elongated 4th digit.

The base of the tail is fawn coloured, the basal area being succeeded by a portion, 75 mm. in length, clothed by coarse black hairs, followed by a terminal portion, 85 mm. long, clothed with long, coarse, white hairs; the terminal dorsal crest projecting another 40 mm.

A curious feature, which seems to have been overlooked in the description of other species, is that the tail ends in a prominent horny process.



Fig. 359. Tail of *T. nigripes*, to show the terminal spur.

The ears are enormously long, the auricle consisting of two distinct portions, a basal tubular portion clothed in the whole of its circumference with fawn-coloured hairs, like those of the head and face; this portion measures about 25 mm. along its anterior aspect. The terminal leaf-like portion is almost entirely naked, extremely thin, dark-grey in colour, and shining. In the living animal the blood vessels are conspicuous and, as in some of the bandicoots, the leaf-like portion of the auricle is punctate with little circular pits about 1 mm. in diameter. The naked portion of the ear is 90 mm. in length.

The eye is black. The mystacial vibrissae are arranged in five rows; the upper and longer bristles being black, the lower and shorter ones white. The longest measures 50 mm. There are two black supraorbital vibrissae; the one is long (45 mm.) and the other only about half that length. The genal set is represented by a tuft of six vibrissae, of which some are black and some are white; the longest measures 60 mm. The ulnar carpal set is well developed, and consists of three or more strong white bristles, of which the longest is 40 mm.

Details of the pouch and nipples not known, as so far no female specimen has been secured; presumably the condition is as in the other species.

The skull is, in its general characters, much as in *T. sagitta*, but from that form it is very readily distinguished in several details. The muscular ridges are

but little marked, the skull is lightly built, and the muzzle is extremely elongated and narrow. The posterior ends of the nasal bones are separated from the line joining the two lachrymal foramina by an interval of 5 mm. The palate is greatly elongated, and extends for a distance of 3 mm. behind the last molar tooth. The posterior portion of the palate is somewhat rounded, the molars being arranged in two slightly crescentic rows. The posterior palatine vacuities are peculiarly small, and they extend from the mid point of the middle premolar only to the anterior margin of the second molar. The small size of these vacuities constitutes a very striking and very constant distinction of the species. The teeth are small, the molars in particular being considerably smaller than those of *T. sagitta*. Considerable intervals exist between the adjacent lingual margins of the individual molars.

The general specific characters of *T. nigripes* may therefore be summed up as follows:

**External Characters.** Size fairly large, head and body length being 320 mm. and upwards. General colour much as in *T. lagotis*. Manus black above over the carpus and metacarpus, white over the digits. Pes black, both above and below, a few white hairs on the base of the ungual phalanx of the fourth digit in some specimens. Tail with the black portion shorter than the white portion.

**Cranial Characters.** Skull fairly large; basal length between 70 and 80 mm., or very slightly more. Muscular crests not well developed. The posterior (molar) portion of the palate slightly rounded in outline; the molars arranged in crescentic rows. The posterior end of the palate extends well behind the last molar tooth. The posterior palatine vacuities reach from about the central point of the middle premolar to the anterior edge of the second molar. The nasal bones extend backwards so that their posterior ends fall short of the line joining the two lachrymal foramina by an interval of about 5 mm. See figs. 353, 355, 356, and 357.

**Dental Characters.** The molars are small. Considerable intervals exist between the lingual margins of adjacent teeth. From the front of the canine to the back of  $M^4$  is a distance of some 35 mm., or slightly more.

A spirit preserved male specimen is in the collection of the South Australian Museum, and I have examined five others, all males. All the specimens have come from a restricted area around Ooldea Soak, and I am indebted to Mr. A. G. Bolam for all the material that I have been able to examine. The Museum specimen was sent in by Mrs. Daisy M. Bates, and all the examples have been captured by the aborigines around the Soak. It is very much to be hoped that further collecting will make it possible to examine a female specimen.



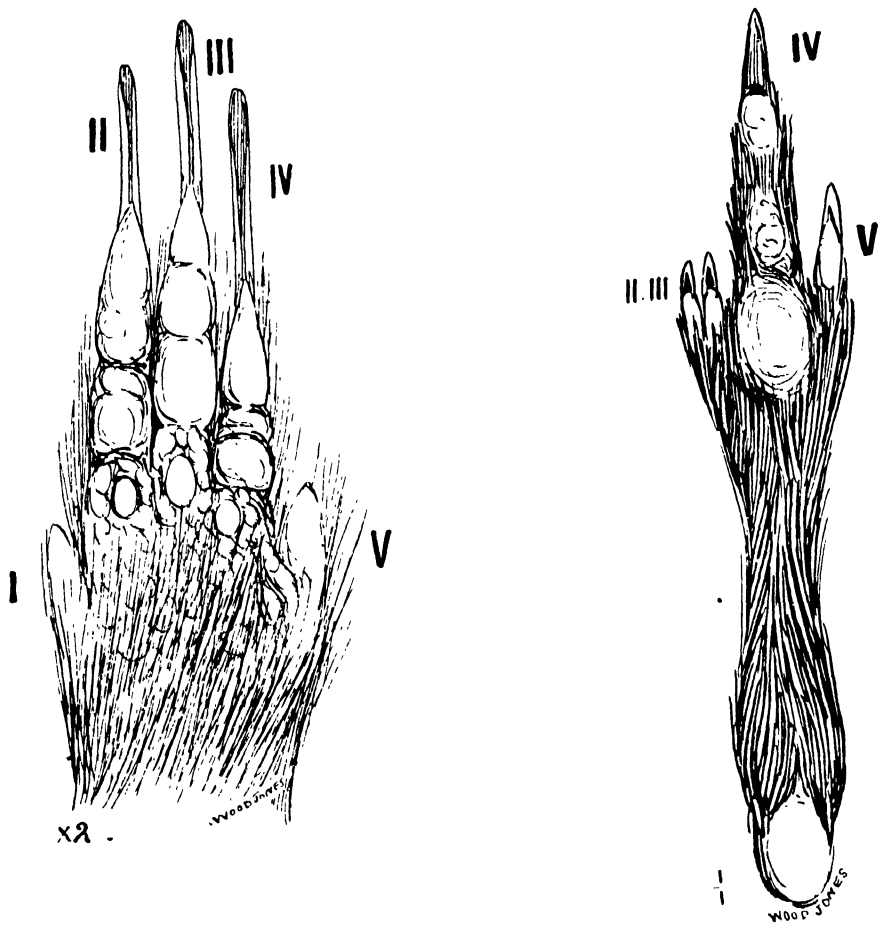


Fig. 360. Left manus (twice natural size) and pes (natural size) of *T. nigripes*.

**Dimensions** (in the flesh).

	Type ♂	Adult ♂	A. Young adult ♂	B.
Head and body . . . . .	390	365	320	
Tail . . . . .	200	220	210	
Hind foot . . . . .	98	96	92	
Fore foot . . . . .	29	29	29	
Ear . . . . .	105-90	110-97	103-90	
Rhinarium to eye . . . . .	57	54	57	
Rhinarium to ear . . . . .	126	125	125	

Two measurements are given for the ear, the first being the dorsal and the second the ventral dimension.

**Dimensions of Skull.**

	Type ♂	Adult ♂ A.
Greatest length . . . . .	86.5	80
Basal length . . . . .	81	72.5
Greatest breadth . . . . .	35	32
Nasals, length . . . . .	40	33
„ breadth . . . . .	8	7
Intertemporal . . . . .	13	12
Palate, length . . . . .	50	48
„ breadth, outside M <sup>3</sup> . . . . .	20	20
„ breadth, inside M <sup>3</sup> . . . . .	12	12
Palatine foramen . . . . .	10	10
C—M <sup>1</sup> . . . . .	37	34.5
M <sup>1</sup> - M <sup>3</sup> . . . . .	13	12

**THALACOMYS LEUCURUS Oldfield Thomas, 1887.**

*Peragale leucura* Thos., Ann. Mag. Nat. Hist. (5), xix, 1887, p. 397, and Cat.

Mars. & Mon. Brit. Mus., 1888, p. 225; Lydek., Mars. & Mon., 1894, p. 134;

Ogilby, Cat. Aust. Mamm., 1892, p. 23.

*Thalacomys leucurus* Cabrera, Gen. Mamm. Mon. & Mars., 1919, p. 82.

The full description of this species being in a standard work, the specific characters will be given here only in summary.

**External Characters.** Size small, head and body length of type specimen (young animal) being 142 mm. General body colour uniform pale yellowish fawn. Manus white. Pes white. Tail white.

**Cranial Characters.** Skull small and delicate; basal length 45 mm.

**Dental Characters.** Molars small.

The type specimen, a very young male, was sent by Mr. Beazley, who was at that time employed as taxidermist to the South Australian Museum, to Oldfield Thomas. The precise locality from which the specimen came is not known, and the example, so far as I can ascertain, remains unique.

Nevertheless I have definite information that a fawn-coloured rabbit bandi-coot was well known to men who were in Western Australia in the comparatively early gold mining days. Sir Baldwin Spencer, who has made repeated efforts to procure further specimens, has hitherto failed to come across any trace of it. Possibly it may yet be found in the vast region of the western portion of the Centre.

**Summary.**

The individual characters as they are present in the different members of the genus may be tabulated as follows:

- (1) Length of head and body, 440-550 mm., *T. lagotis*.  
 " " " 320-390 mm., *T. nigripes*.  
 " " " 316 mm., *T. sagitta*.  
 " " " 200-270 mm., *T. minor*.  
 " " " 142 mm., *T. leucurus*.
- (2) Manus. White in *T. lagotis*, *sagitta*, *minor*, and *leucurus*.  
 " Black over carpus and metacarpus, white over digits, *T. nigripes*.
- (3) Pes. White above and below, *T. leucurus*.  
 " White above; posterior  $\frac{1}{3}$  black below, *T. sagitta*.  
 " White above; posterior  $\frac{1}{2}$  or more black below, *T. lagotis*.  
 " White above; posterior  $\frac{2}{3}$  black below, *T. minor*.  
 " Black above and below, *T. nigripes*.
- (4) Tail. Black portion as long as, or longer than, white portion, *T. lagotis*,  
*T. minor*.  
 " Black portion shorter than white portion, *T. sagitta*, *T. nigripes*.  
 " White throughout, *T. leucurus*.
- (5) Skull. Basal length, 92-105 mm., *T. lagotis*.  
 " " " 80-81 mm., *T. nigripes*.  
 " " " 74-76.5 mm., *T. sagitta*.  
 " " " 66 mm., *T. minor*.  
 " " " 45 mm., *T. leucurus*.
- (6) Palate. Extending some distance behind M<sup>1</sup>; distinctly rounded in its  
 posterior portion, *T. lagotis*.  
 " Extending some distance behind M<sup>4</sup>; only slightly rounded in its  
 posterior portion, *T. nigripes*, *T. minor*.  
 " Terminating at M<sup>4</sup>; scarcely rounded in its posterior portion,  
*T. sagitta*.
- (7) Posterior palatine vacuities from mid-point of middle premolar to mid-  
 point of M<sup>3</sup>, *T. lagotis*.  
 " To mid-point of M<sup>2</sup>, *T. sagitta*, *T. minor*.  
 " To anterior border of M<sup>2</sup>, *T. nigripes*.
- (8) Nasals. Extending back almost to the line joining the two lachrymal  
 foramina, *T. lagotis*.  
 " Falling short of such a line by an interval of some 4-5 mm.,  
*T. nigripes*, *T. sagitta*, *T. minor*.
- (9) Distance from front of canine to back of M<sup>4</sup>, 42.5-45 mm., *T. lagotis*.  
 " " " 36-37 mm., *T. sagitta*.  
 " " " 34.5-37 mm., *T. nigripes*.  
 " " " 28 mm., *T. minor*.

# AUSTRALIAN DUNG BEETLES OF THE SUB-FAMILY COPRIDES

By ARTHUR M. LEA, F.E.S., ENTOMOLOGIST, S.A. MUSEUM

Plates vi-ix.

IN comparison with other parts of the world Australia has but few Coprides, mostly below the average size of those occurring elsewhere; the largest species, *Aulacopris reichei*, seldom reaching a body-length of an inch and a quarter. This, however, is only to be expected considering the dearth of large indigenous mammals. Dung beetles of several kinds have multiplied with the distribution of the cow and horse, and many European species have been introduced, especially in the Aphodiides and Staphylinidae.

Some of our genera are of exceptional interest, such as *Macropocopris*, species of which live in the fur about the anal region of marsupials, and have developed extremely powerful claws; one species, *M. symbioticus*, has been found in the cloaca of a wallaby. Dr. J. F. Illingworth informed me that *Pedaria geminata* habitually uses, for its own young, dung-balls formed by other species of Coprides.

The following is a list of the species previously recorded as occurring in Australia, synonyms being printed in italics:

Actinophorus leei Shipp.	Coptodaetyla baileyi Blackb.
Aulacopris reichei White.	<i>aenticeps</i> Felsche.
Canthonosoma castelnaui Har. ( <i>Cephalodesmus</i> ).	ducalis Blackb.
macleayi Har. ( <i>Cephalodesmus</i> ).	glabricollis Hope.
mastersi Mael.	monstrosa Felsche.
<i>Homodesmus haroldi</i> Sharp.	subaenea Har.
planus Sharp ( <i>Homodesmus</i> ).	Epilissus globulus Mael.
Catharsius australiae Shipp.	niger Lansb.
<i>tricornutus</i> Felsche.	ustulatus Lansb.
Cephalodesmus armiger Westw.	Labroma horrens Sharp.
cornutus Mael.	<i>Menthophilus tuberculatus</i>
laticollis Pasc.	Waterh.
minor Blackb.	Macropocopris carmodensis Blackb.
quadridens Mael.	( <i>Onthophagus</i> ).
Copraecus hemisphaericus Guer.	kingi Har ( <i>Onthophagus</i> ).
	<i>O. muticus</i> Mael.

- parvus Blanch (*Onthophagus*).  
     *O. inermis* Mael.  
     *O. submuticus* Blackb.  
 prehensilis Arrow.  
 symbioticus Arrow.  
 Minthophilus carinatus Reiche.  
     *hollandiae* Boi.  
     subsulcatus Sharp.  
 Monoplistes haroldi Lansb.  
 Onthophagus aenticeps Mael.  
     adelaïdae Hope.  
     *hostilis* Har.  
     anisocerus Er.  
     *cupreoviridis* Blanch.  
     *fuliginosus* Er.  
     asper Mael.  
     *patruelis* Har.  
     atrox Har.  
     *quinquetuberculatus* Mael.  
     *palmerstoni* Blackb.  
     *pugnacior* Blackb.  
     *sloanei* Blackb.  
     aureoviridânus Blackb.  
     auritus Er.  
     *cereus* Hope.  
     *micans* Sturm.  
     *umbraculatus* H. & J.  
     australis Guer.  
     *capella* Boi (nec Kirby).  
     bicornis Mael.  
     bipustulatus Fabr.  
     blackburni Shipp.  
     *nitidior* Blackb.  
     blackwoodensis Blackb.  
     capella Kirby.  
     captiosus Har.  
     carteri Blackb.  
     comperei Blackb.  
     consentaneus Har.  
     *granulatus* Mael.  
     conspicuus Mael.  
     *bovilli* Blackb., var.  
     cowleyi Blackb.  
     crotchii Har.  
     cruciger Mael.  
     cuniculus Mael.  
     declivis Har.  
     *desectus* Mael., var.  
     devexus Mael.  
     discolor Hope.  
     dumbrelli Blackb.  
     dunningi Har.  
     emarginatus Mael.  
     erichsoni Hope.  
     evanidus Har.  
     fabricii Waterh.  
     ferox Har.  
     *inacqualis* Dej.  
     *mniszecchi* Har.  
     fissiceps Mael.  
     fitzroyensis Blackb.  
     fletcheri Blackb.  
     frenchi Blackb.  
     furcaticeps Masters.  
     *froggatti* Mael.  
     *furcatus* Mael.  
     *lobicollis* Mael., var.  
     geelongensis Blackb.  
     glabratus Hope.  
     granulatus Boh.  
     granum Lansb.  
     haagi Har.  
     helmsi Blackb.  
     henleyensis Blackb.  
     humator Shipp.  
     *humeralis* Mael.

- howitti Blackb.  
 incanus Mael.  
 incornutus Mael.  
 integriceps Mael.  
 jubatus Har.  
     *duboulayi* Waterh.  
 koebelei Blackb.  
 laminatus Mael.  
     *cowleyi* Blackb.  
     *pugnax* Har.  
 latro Har.  
 leai Blackb.  
 lucidicollis Boh.  
 macleayi Blackb.  
 macrocephalus Kirby.  
 margaretensis Blackb.  
 mastersi Mael.  
 minusculus Mael.  
 murchisoni Blackb.  
 mutatus Har.  
     *hirculus* Er.  
 muticus Mael.  
 nanus Waterh.  
 negatorius Blackb.  
 nodulifer Har.  
     *divaricatus* Mael.  
 ocelliger Har.  
 parallelicornis Mael.  
 pentacanthus Har.  
     *quadridentatus* Hope.  
 perpilosus Mael.  
 pexatus Har.  
 picipennis Hope.  
 planicollis Har.  
 pontilis Blackb.  
 posticus Er.  
     *flavolineatus* Blanch.  
 promptus Har.  
 pronus Er.  
 propinquus Mael.  
 purpureicollis Mael.  
 quadripustulatus Fabr.  
 queenslandicus Blackb.  
 rubescens Mael.  
 rubicundulus Mael.  
 rubrimaculatus Mael.  
     *decurio* Lansb.  
 ruficapra Waterh.  
 rufosignatus Mael.  
 rogus Kirby.  
 salebrosus Mael.  
 schmeltzi Har.  
 subocelliger Blackb.  
 sydneyensis Blackb.  
 tabellicornis Mael.  
 tamworthi Blackb.  
 thoreyi Har.  
 tweedensis Blackb.  
 victoriensis Blackb.  
     *jungi* Blackb.  
 vilis Har.  
 villosus Mael.  
 viridiobseurus Blanch.  
 walteri Mael.  
 zietzi Blackb.  
 Panelus bidentatus Wilson.  
     pygmaeus Mael. (*Temnoplectron*).  
     *arthuri* Blackb.  
 Pedaria geminata Mael. (*Aphodius*).  
 Platyphymatia aeneopicea Waterh.  
     calcarata Mael.  
     squalida Mael.  
     tuberculata Lansb.  
 Temnoplectron diversicolle Blackb.  
     laeve Waterh.  
     lucidum Mael.  
     occidentale Mael.

politulum Mael.	hollandiae Fab.
rotundum Westw.	<i>norachollandiae</i> Boï.
tibiale Mael.	piceus Hope.
Tesserodon angulatus Westw.	variolosus Mael.
gestroi Lansb.	Thyregis kershawi Blackb.

**CANTHONOSOMA MACLEAYI Har. (Cephalodesmius), 1868.**

*Canthonosoma mastersi* Mael., 1871.

*Homodesmius haroldi* Sharp, 1873.

Plate vi, figs. 1, 2.

Macleay described the front legs of *Canthonosoma* as without tarsi, and this is the case with most of the specimens of *C. mastersi* before me, but this is certainly due to wear or accident, as on one co-type the right tarsus is present, on another both are present; the front tibiae often have the appearance as of being worn down, and the projection on each side of the median notch of the clypeus also diminishes in size with usage; on worn specimens the bronzy gloss disappears and most of the setae of the upper-surface. Two specimens before me are from Rockhampton, and agree with the description of *Homodesmius haroldi*, which I can only regard as a synonym; the species, however, was first described as *Cephalodesmius macleayi*.

**CANTHONOSOMA CASTELNAUI Har. (Cephalodesmius).**

Plate vi, figs. 3, 4.

Two females from Pine Mountain (Queensland) were labelled in the Simson collection as *Cephalodesmius castelnaui*, and apparently correctly so. Several males from Capella (Queensland) differ from them in having the sides (epipleurae) of the elytra so compressed that from above each elytron appears to be bounded by a strongly elevated and rather narrow ridge. The small shining tubercles on the prothorax are more conspicuous than on the female, and the metasternum has an obtuse tubercle in front.

**CANTHONOSOMA PLANUM Sharp (Homodesmius).**

This species<sup>(1)</sup> was not recorded in Masters' Catalogue, and evidently also

(1) Sharp, Rev. et Mag. Zool., 1873, p. 37.

belongs to *Canthonosoma*.

**COPRAECUS HEMISPHAERICUS Guer.**

Plate vi, fig. 5.

I have not seen the original description of this species, but the figure given in Cuvier's Animal Kingdom<sup>(2)</sup> shows two spines on each of the middle and hind tibiae, although on figure 3a only one spine is shown; Reiche<sup>(3)</sup> described and figured the tibiae as unispinose, and his figure is considerably narrower than that of Westwood's.<sup>(4)</sup> The species is a very rare one, and no locality, other than "Australia," has been noted for it; but there are now before me three specimens varying in length from 13 to 16 mm., from East Kimberley and Broome. The species may be readily distinguished by the elytra; each of these has six, moderately elevated, shining interstices, with a row of setiferous punctures on each side (but the setae appear to be easily abraded); the middle tibiae are bispinose, the hind ones unispinose; on the male only there is a curved process at the apex of the hind tibiae.

The species is probably congeneric with *Canthonosoma macleayi*, from which the male differs in having the surface less opaque, elytral interstices shining, hind tibiae with an apical hook, and metasternum non-tuberculate.

**TESSERODON VARIOLOSUS MacL.**

Two specimens from Groote Eylandt appear to represent a variety of this species; they are smaller (4.5–4.75 mm.) than usual, and have the elytral interstices slightly elevated posteriorly.

**TESSERODON INTRICATUS sp. nov.**

♂ Black, antennae palpi and tarsi reddish, club flavous. Under-surface and legs rather sparsely clothed, upper-surface with very short setae.

Head with crowded and fairly large asperate punctures. Clypeus with two conspicuous median projections, and two smaller submedian ones, separated by notches. Prothorax more than twice as wide as the median length, front angles produced and rounded, hind ones obtuse; with crowded longitudinal punctures, many of which are confluent. Elytra with sides rounded and evenly continuous with those of prothorax, with narrow geminate striae, interstices wide, elevated and shining in middle, with a row of large but shallow setiferous punctures on each side. Metasternum with large squamose punctures, sparser in middle than on sides. Front tibiae stout and strongly tridentate, hind ones rather thin, with an inner apical hook. Length, 5.5–6 mm.

(2) London edition, 1832, xiv, pl. xlv, fig. 3.

(3) Reiche, Ann. Soc. Ent. Fr., 1842, p. 72, pl. v, fig. 2.

(4) Westwood, Trans. Ent. Soc. iv, pl. viii, fig. 3.



♀ Differs in having the hind tibiae without an apical hook, and the teeth of the front ones somewhat larger.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15426.

Like *T. gestroi* on a greatly reduced scale, but the prothoracic punctures are narrower and the middle of each interstice more distinctly elevated; on *T. variolosus* they are scarcely separately convex. The rows of setae on the elytra are short, pale, and slope backwards.

### MONOPLISTES.

The species here referred to *Monoplistes* in general resemble small specimens of *Temnoplectron*, but have the claws unarmed, although somewhat thickened at the base. They all have the middle and hind tibiae strongly curved, and each with a long apical spur that at first glance appears to be part of the tibia itself. The pygidium near its summit is traversed by a narrow deep line.

#### MONOPLISTES CURVIPES sp. nov.

♂ Black, highly polished; antennae, palpi, and tarsi more or less reddish.

Head gently convex, with rather small punctures, becoming larger and denser on sides; front with six acute teeth, the two median ones longer than the others, and the notch between them deeper. Prothorax widely transverse, front angles strongly produced and very acute, sides widely dilated to near base, and then slightly narrowed to base, median line well defined near base, but disappearing before middle; with a wide shallow sub-basal depression near each side; punctures sparse and minute, but becoming larger and more numerous, although not crowded on sides, a row of large ones at extreme base. Elytra closely embracing prothorax, base strongly incurved; with slightly impressed but distinct striae containing small, distant punctures. Flanks of sterna with rather dense, asperate punctures. Front tibiae long, thin, strongly curved, with two small and fairly large acute teeth; middle and hind tibiae moderately curved and each with a long spur, continuing the curve. Length, 6-7.5 mm.

♀ Differs in having the head smaller, prothorax longer, more evenly convex, sides strongly but almost evenly rounded, sublateral foveae smaller but deeper, front tibiae much shorter, less strongly curved, more dilated at apex, notched on inner side near base, and the other tibiae shorter.

*Hab.* Queensland: Mulgrave and Little Mulgrave Rivers (H. Hacker), Cairns district (A. M. Lea). Type, I. 3719.

There is a swelling near the base of each claw, but as it is not at all acute the species was referred to *Monoplistes* rather than to *Temnoplectron*, to which at

first it appears to belong; the male resembles *T. tibiale*, but in that species the claws are acutely dentate and the tibial spurs are very different. On three specimens the legs are entirely reddish, probably from immaturity. The sides of the prothorax are more conspicuously dilated to near the base on one male than on another, and are notably upturned before narrowing to the base.

### **MONOPLISTES PHANOPHILUS sp. nov.**

Black, highly polished; antennae, palpi, and tarsi pale reddish.

Head slightly convex and with small and rather sparse punctures between eyes, becoming larger and more numerous but scarcely crowded on sides; front with six teeth, of which the median ones are fairly long, acute, and separated by a deep notch, the others are much smaller and separated by shallow notches. Prothorax about twice as wide as the median length, sides parallel on basal half, then oblique to apex, where the angles are acute; with small and numerous but not dense, sharply defined punctures, and a row of somewhat larger ones at base; sublateral foveae vaguely defined. Elytra closely applied to prothorax, sides gently rounded; with narrow striae, containing rather small, distant punctures; interstices with very small punctures. Metasternum with large but shallow subreticulate punctures on sides, minute ones in middle. Front femora stout and moderately dentate; front tibiae rather strongly curved, dilated, and with a strong tooth at outer apex and two small ones near it, distinctly notched near inner base; other tibiae distinctly curved, and each with a long terminal spur. Length, 5–5.25 mm.

*Hab.* Queensland: Gordonvale and Cairns, at lights (Dr. J. F. Illingworth). Type, I. 15429.

Smaller than *M. curvipes*, from the female of which it differs in the prothorax with sides partly parallel, with somewhat larger punctures, and less distinct sublateral foveae, and front tibiae with inner basal notch more conspicuous. Of four specimens taken by Dr. Illingworth, two have the front tibiae somewhat longer and thinner than the others, but not to such a striking extent as on *M. curvipes*, so they are possibly all females. Two specimens from the Simson collection from Bowen (Queensland) differ in having the punctures on the head somewhat denser and coarser, and the punctures in the elytral striae slightly larger. Another from the Northern Territory (from Dr. Bovill in the Blackburn collection) has punctures on the head similar to those on the Bowen specimens, but those in the elytral striae are smaller; the notch at the inner base of its front tibiae is preceded by a conspicuous tubercle, that on the other specimens appears more as the sudden termination of a ridge. This specimen, by its number in Blackburn's note-book, was doubtfully identified as

*M. haroldi*, but it is considerably larger than the type of that species (3 mm.) and the head is not "*sat fortiter granulato*."

Var.? A. Fourteen specimens without locality labels (but probably from the Northern Territory, and two of them bearing Blackburn's No. 7279) have punctures as in the Bowen specimens, but are less shining, and the elytra are shagreened and opaque; if this condition is natural they probably represent an undescribed species.

Var.? B. Six specimens similarly pinned to A (and two also bearing Blackburn's No. 7279) are structurally similar, but the elytra are not shagreened or opaque; their sides, from front of head to tips of elytra, are obscurely reddish, but to a variable extent.

### **MONOPLISTES TROPICUS sp. nov.**

Black, highly polished, legs obscurely reddish, antennae, palpi, and tarsi paler, club infuscated.

Head gently convex and with minute punctures between eyes, larger and more numerous, but not crowded, ones on sides; front with six acute teeth, of which the median ones are longer and more acute than the others. Prothorax more than twice as wide as the median length, sides very narrowly margined, admost parallel on basal two-thirds, then oblique to apex, where the angles are slightly produced but very acute; with minute but sharply defined punctures, and a row of larger ones at base. Elytra closely applied to prothorax; with narrow but well defined striae, containing small distant punctures, interstices feebly separately convex, and with scarcely visible punctures. Metasternum with dense and rather large punctures on sides, becoming very minute in middle. Front femora moderately dentate; front tibiae moderately curved, apex dilated, with three acute outer teeth, the apical one much larger than the others, notched near inner base; hind tibiae moderately curved, and each with a long terminal spur. Length, 3.5-4 mm.

*Hab.* Queensland: Cairns district (F. P. Dodd and A. M. Lea). Type, I. 15435.

A briefly oblong-elliptic species, smaller than *M. phanophilus*, and elytral striae more deeply impressed, with the interstices feebly separately convex. The larger specimen has much less acute tibial teeth than the type (which was taken from a sticky seed of *Pisonia brunoniana*), but this may be due to abrasion. Two specimens from Wyndham (J. Clark from W. Crawshaw) appear to belong to the species, but have the punctures in the elytral striae slightly larger and closer together, and the punctures on the interstices rather sharply defined, although very minute.

**EPILISSUS USTULATUS** Lanab.

Five specimens, from Cairns and the Little Mulgrave River, probably belong to this species; four of them have the shoulders conspicuously paler than the adjacent parts; of these four, two have the apical sides and epipleurae also pale, of these two, one is mostly blackish, the other mostly castaneous; the fifth specimen has the entire upper-surface dark piceous-brown. They all differ from the description, however, in having the club of the antennae partly infuscated, and the front tibiae acutely bidentate outwardly, but there is a blunt tooth at the inner apex. If correctly identified the species should be transferred to *Panelus*.

**PANELUS BIDENTATUS** Wilson.

Three specimens, taken from rotting leaves at Ourimbah and National Park (New South Wales), and Mount Tambourine (Queensland), structurally agree with the type, but they all differ somewhat in colour. On the National Park specimen the pale humeral and subapical spots on each elytron are enlarged and connected along the side; on the Ourimbah one the pale parts of each elytron are further enlarged to cover most of the surface, leaving only a moderate infuscation about the scutellum, the head and prothorax are also almost entirely pale; on the Mount Tambourine specimen the prothorax and elytra are entirely dark.

**PANELUS PISONIAE** sp. nov.

Pale flavo-castaneous, highly polished, extreme base and suture of elytra very narrowly black, club infuscated.

Head gently convex and with minute punctures between eyes, a subtriangular projection on each side of a deep medioapical notch. Prothorax more than twice as wide as the median length, sides on basal two-thirds subparallel, then oblique to apex, where the angles are acute; punctures minute, but a row of slightly larger ones at extreme base. Elytra closely applied to prothorax; striae faintly impressed, interstices with minute punctures. Front tibiae bidentate externally, the apical tooth larger than the other. Length, 2–2.5 mm.

*Hab.* Northern Queensland (Blackburn's collection), Cairns district, taken in abundance from sticky seeds of *Pisonia brunoniana* (F. P. Dodd). Type, I. 15432.

The pale colour and feeble elytral striation at once distinguish this species from *P. pygmaeus*; the persistently smaller size and paler colour from *P. bidentatus*. On most specimens there appears to be a large infuscated spot near the apex of each elytron, but this is entirely due to the apical fold of the wings showing through. On most specimens the elytral striae are very feeble and traceable only near base, but on some of the smaller ones they are fairly distinct, and contain small, distant punctures.

**LABROMA HORRENS Sharp.**<sup>(5)</sup>*Menthophilus tuberculatus* Waterh.<sup>(6)</sup>

Plate vi, fig. 6.

These names were founded upon one species; apparently *L. horrens* has precedence.

**AULACOPRIS REICHEI White.**

Plate vi, figs. 8, 9.

This is the largest, finest, and one of the rarest dung beetles in Australia. Single specimens have been taken in Queensland, New South Wales, and Victoria, but Mr. Edgar R. Waite obtained two specimens in the Yessabah caves on the Macleay River; they had formed sixteen bat-dung balls of the size of walnuts, each containing a larva or pupa (in one instance an egg). After being exhibited at a meeting of the Linnean Society of New South Wales<sup>(7)</sup> some of them were reared to maturity in the Australian Museum.

**MERODONTUS CALCARATUS MacL.**

Plate vi, fig. 11.

The small and narrow eyes of this species are shining and scarcely visibly faceted, each is flat and surrounded by a slightly elevated margin, so that it appears to be slightly concave. The tooth on the hind femora is twice as large on some specimens as on others.

**COPTODACTYLA BAILEYI Blackb.**

I concur with Blackburn's opinion that *C. baileyi* is distinct from *C. glabricollis*.

**COPTODACTYLA DUCALIS Blackb.***C. acuticeps* Felsche.

Plate vi, figs. 10, 11.

Felsche considered that *C. ducalis* also was a synonym of *C. glabricollis*; only the female was known to Blackburn, but it is abundantly distinct from *glabricollis*; the male was described by Felsche himself as *C. acuticeps*.

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(5)Sharp, Rev. et Mag. Zool., 1873, p. 263.

(6)Waterhouse, Ent. Mo. Mag., Jan., 1874, p. 176.

(7)Proc. Linn. Soc. N. S. Wales, 1898, p. 803.

**ONTHOPHAGUS.**

Specimens of the Australian species of *Onthophagus* known to Blackburn are before me, with the exception of *O. bipustulatus*, *O. carmodensis*, and *O. helmsi*. I have carefully tried to follow his grouping of the species, but am unable to do so, even his Group 1, consisting of a few large species, appears to be scarcely distinguishable, by the basal edging of the pronotum alone, from some members of other groups, as many of these have the marginal edging even throughout, although not so highly elevated as on those he referred to Group 1. The species of Group 4 might well be distributed between those of all groups, except 1. The difference between a flat or feebly convex base and one very faintly concave is so slight that it can seldom be of much use, so that I follow Arrow, who considered that "The supposed difference in the prothoracic margin is illusory." Blackburn considered that tables based largely on male characters are not desirable, but they have at least the advantage of enabling many species to be quickly identified, thus serving at least one of the main uses of a table. Probably had he used the facets of the eyes, for the primary divisions, the tables would have been more satisfactory, even although they apparently alter on some specimens on drying, their true nature is generally at once evident if they are viewed from oblique directions; the clypeal suture could also have been used to a greater extent, although with some species it varies sexually.

**ONTHOPHAGUS AUSTRALIS Guer.**

Plate viii, figs. 31–33.

The whole upper-surface of fresh specimens of this species has a curious satiny gloss; the interocular horns and ridge of the male vary considerably.

**ONTHOPHAGUS MASTERSI MacL.**

Plate viii, figs. 34, 35.

In Blackburn's table this species is separated from *O. australis* by being "Black, not at all metallic"; but on the male the prothorax has sometimes an obscure metallic-green gloss; structurally it is extremely close to some forms of *O. australis*.

**ONTHOPHAGUS MACROCEPHALUS Kirby.**

Plate viii, figs. 36, 37.

The cephalic horn on the male of this species sometimes extends almost to the elytra, but it is usually much shorter.

**ONTHOPHAGUS LAMINATUS** MacI.

Plate vii, figs. 12-20.

In commenting on *O. quinquetuberculatus*, Blackburn<sup>(8)</sup> considered the name was probably a synonym of *O. atrox*. If Macleay rightly mated the specimens standing as types (and this certainly appears to be the case), the male is a specimen of the species Blackburn identified as *O. atrox*, with the punctures of the prothorax less coarse than usual, and with its median prominence more produced and narrower at the tip than usual; the head and elytra being in exact agreement. The female agrees with specimens identified by Blackburn as *O. pugnax*.

As with many other species of the genus, the sexes may differ strongly, or approach each other so closely that from external observation of the upper-surface it is difficult to decide as to the sex of an individual. A freshly matured specimen is often much more polished than an old one, and with age the clothing (Blackburn relied upon this in *O. atrox*) is apt to become abraded, tibial teeth, and projections on the head (especially the front ones used for shovelling), and prothorax to become blunted, etc.

I believe that but few of the names treated as distinct in Blackburn's Group 2, up to and inclusive of *O. pugnax*, can be maintained, and that the character, "The basal gutter of the pronotum dilated hindward in the middle," as against "not dilated hindward," to be quite worthless; the differences there are slight, only of degree, and liable to individual rather than specific variation, and the other characters used are mostly of degree. Blackburn partly relied upon the crenulations of the front tibiae of *O. cowleyi* as a useful distinguishing feature from those of *O. laminatus*, but on two of the specimens he had as *O. laminatus*, and bearing the same number (1424), one specimen has respectively eight and nine on the front tibiae, and the other five and six; on *O. cowleyi* they were noted as six or seven. The punctures of the prothorax are decidedly variable, but the elytra are always fine shagreened and with small scattered punctures; the striae are also but little liable to variation.

From the specimens in the South Australian Museum, being those examined by Blackburn, with the exception of a few specimens (only the type of *O. palmerstoni* was known to him, but I have carefully examined his description of that form), it appears probable that the synonymy is as follows:

**laminatus**, MacI., 1863 (*pugnax*, Har., 1868; *cowleyi*, Blackb., 1903).

**atrox**, Har., 1867 (*quinquetuberculatus*, MacI., 1871; *palmerstoni*, Blackb., 1903; *sloanei*, Blackb., 1903; *pugnax*, Blackb., 1903).

With the distinct possibility that all the names should be regarded as

(8) Trans. Roy. Soc. S. Aust., 1903, p. 274.

synonymous, with *laminatus* (certainly not the most abundant form) having priority. There are also many other forms before me that differ slightly from the various forms known to Blackburn, but it does not appear desirable to name them, even as varieties.

### **ONTHOPHAGUS FURCATICEPS Masters.**

*O. furcatus* Mael., n. pr.

*O. froggatti* Mael.

*O. lobicollis* Mael., var.

Plate ix, figs. 61–63.

The types of *O. furcaticeps* and of *O. froggatti* differ slightly in colour, but on placing them side by side a few years ago I could find no structural differences. The female differs from the male in having the clypeus coarsely sculptured, the inter-ocular carina elevated into a short wide triangle on each side, the prothorax with a bilobed protuberance in front (very variable in size), on each side of which is a deep cavity, and the front tibiae shorter and stouter; the prothorax has a gloss varying from greenish to purplish.

A specimen that was compared with the type of *O. lobicollis* and agreed well with it has the apical segment of the abdomen not at all narrowed in its middle, so is evidently a female<sup>(9)</sup>; the remarkable development of the prothoracic process appears to be an exaggeration of that of the female of *O. furcaticeps*, of which it should be regarded as a variety.

### **ONTHOPHAGUS WALTERI Mael.**

Plate ix, figs. 64, 65.

On the female of this species the interocular ridge is gently convex throughout, on the male it is elevated on each side near the eye and vanishes in the middle; the prothoracic processes vary in size on the male, and on the female have a worn-down appearance. On the male the two apical segments of abdomen are strongly narrowed to the middle, the apical one almost vanishing there.

### **ONTHOPHAGUS FISSICEPS Mael.**

Plate vii, figs. 21, 22.

Six specimens from Wyndham (three of each sex) evidently belong to this species, but they are all smaller (10–12 mm.) than the type (6 lines). The facets of the eyes are distinct, and in Blackburn's table the species would be referred to

<sup>(9)</sup>Arrow, Ann. and Mag. Nat. Hist., Oct., 1920, p. 435.



Group 3, near *O. capella*, although it is nearer to *O. erichsoni*, but the prothorax has the median projections more divergent in the male, the punctures coarsely rugose, the head with a strongly arched line between the eyes, and the clypeus notched. The female differs from the male in having the carina between the eyes narrowly elevated and less curved, the space between it and the clypeal suture with denser and larger punctures, the clypeus less notched, prothorax with median projections replaced by a ridge (emarginate in its middle, somewhat as on *O. pugnar*), and the front tibiae much shorter. From the female of *O. erichsoni* it differs in the coarser prothoracic and cephalic punctures, and by the interocular ridge being less elevated in the middle. It is probable that the type of *O. integriceps* (noted by Macleay as a male) is really a female of *O. fissiceps*.

### **ONTHOPHAGUS CUNICULUS Macl.**

Plate ix, figs. 66, 67.

The head and prothorax of this species are sometimes coppery-purple; the metallic part of the head usually terminates at the clypeal suture in the female, slightly beyond it in the male.

### **ONTHOPHAGUS CONSPICUUS Macl.**

Plate viii, figs. 38, 39.

On an occasional specimen of this species the head and prothorax (except the basal gutter) are of a bronzy-purple, and the elytra purplish-green.

### **ONTHOPHAGUS NODULIFER Har.**

Plate viii, figs. 40, 41.

The males of this species vary greatly in the processes of the head and prothorax. The various forms before me are as follows:

1. Cephalic horns thin, strongly curved, each distinctly longer than the head is wide; clypeus almost evenly arched in front, prothoracic protuberance beginning as a median carina and projecting forwards over a medio-apical cavity.

Var. *divaricatus* Macl. Gayndah (Queensland).

2. As 1, but prothoracic protuberance considerably reduced in size and blunt. The typical form. Rockhampton (Queensland).

3. Cephalic horns much shorter and stouter, scarcely one-third as long as the head is wide; clypeus with two feeble projections in front; prothoracic protuberance an obtuse tubercle capping a slight hollow. Emerald (Queensland).

4. As 3, but clypeus evenly arched except for a slight incurvature in middle. Northern Queensland.

5. Interoocular ridge arched forwards, but its sides not elevated into horns or tubercles, clypeus evenly arched, except that its middle is truncated; prothoracic protuberance very feeble, no depression in front of it. Bowen (Queensland).

6. As 5, but clypeus with two projections in front. Connexion Island (Northern Territory) and Derby (North-western Australia).

All these forms have the eyes large, without distinct facets, clypeal carina almost evenly arched backwards with the middle slightly elevated, prothorax with shallow but not very small punctures, distinct on the feebly-armed specimens, tending to obliteration on the strongly-armed ones, with margins distinct throughout, and elytra shagreened and opaque.

### **ONTHOPHAGUS DUNNINGI Har.**

Plate ix, figs. 68, 69.

A rare species, which appears to live solely in agaric fungi; the horns on the head and prothorax of the male vary considerably in length.

### **ONTHOPHAGUS HAAGI Har.**

Plate viii, figs. 42–44.

A very distinct species, but varies greatly in size; on the female the interocular ridge is sometimes moderately elevated and interrupted in middle, sometimes strongly elevated and almost even throughout, on others with a conspicuous process (almost a horn) on each side of it; the horn on the head of the male varies in length, but its summit is always distinctly bifid.

### **ONTHOPHAGUS FEROX Har.**

Plate vii, figs 23, 24.

On some specimens of this species the cephalic horn is little more than a short conical tubercle, on others it is much longer and rises well above the level of the pronotum; the prothoracic horns also vary greatly in length and acuteness.

### **ONTHOPHAGUS PENTACANTHUS Har.**

Plate vii, figs. 25, 26.

The median processes of the prothorax and the cephalic horn of this species vary in much the same way as do those of *O. ferox*.

**ONTHOPHAGUS PROMPTUS Har.**

The type of this species was almost certainly a female. Specimens of both sexes were taken on Groote Eylandt, and others before me are from Darwin and Cape York. The male differs from the female in having the clypeus not transversely vermiculate, but with fairly dense and rather shallow punctures, the prothorax wider, somewhat retuse in front and apical segment of abdomen incurved to middle; the lateral margins of the prothorax are distinct, but the base appears to be immarginate, unless separated from the elytra, when a very feeble margin may be seen. The eyes are narrow and with distinct facets. In general appearance the species resembles *O. margaretcensis* on a large scale, but the female differs from the type (a female) of that species in having the clypeus truncated in front, the interocular ridge less abruptly elevated and somewhat sinuous, prothorax with smaller punctures, and median line well defined on at least the basal half, instead of but feebly defined and close to the base only.

**ONTHOPHAGUS PLANICOLLIS Har.**

Plate ix, fig. 70.

A specimen from Moa or Banks Island (near the original locality, Somerset) evidently belongs to this species, as its elytra have the alternate interstices elevated and with rows of granules, but these granules and the large punctures on the head and prothorax are each supplied with a stiff upright seta; no setae were mentioned in the description before me (a written copy of the original one), so that probably the type was abraded.

**ONTHOPHAGUS ANISOCERUS Er.**

*O. fuliginosus* Er.

Plate viii, figs. 45-47.

In his table Blackburn separated these forms by the crenulations of the elytra, "distinctly punctiform" in *O. anisocerus* and "not punctiform" in *O. fuliginosus*, but the specimens from his collection (now in the South Australian Museum) do not warrant specific separation. Erichson apparently relied upon the differences in colour and in the cephalic horns, but these are all variable, the lateral horns are twice as long on some Tasmanian specimens as on others, and the median process varies from feebly elevated and scarcely double to strongly elevated and conspicuously bifid, so that I cannot regard *O. fuliginosus* as deserving even of a varietal name. Two males, from the Queensland National Park, have the lateral horns longer than usual, with the median process in the form of a

long-based Y; another male, taken with them, has the process represented by a feeble node only.

### **ONTHOPHAGUS PRONUS Er.**

Plate vii, fig. 27.

This species varies considerably in size. On some males the prothoracic horn projects beyond the head, on others it terminates short of the clypeus.

### **ONTHOPHAGUS TWEEDENSIS Blackb.**

Plate viii, figs. 48, 49.

Of three males of this species before me (from Stradbroke Island) each has the elevation between the cephalic horns trilobed and the suture greenish. The female (three from Stradbroke Island and one from Bribie Island) differs from the male in having denser and coarser punctures on the head, no horns between the eyes, but a feeble ridge curved backwards, the prothorax with coarser punctures and scarcely refuse in front, and the front tibiae shorter, with stouter teeth.

### **ONTHOPHAGUS HENLEYENSIS Blackb.**

A specimen from Yilgarn, unfortunately without antennae or tarsi, possibly belongs to this species, but differs from some typical specimens in having the prothorax conspicuously greenish, less convex, with smaller punctures and a distinct medio-apical depression.

### **ONTHOPHAGUS BOVILLI Blackb.**

Plate viii, fig. 50.

The type of *O. bovilli* has the apical segment of abdomen not at all narrowed in the middle, so it is a female, as suspected by Blackburn; it is much less metallic than is usual in *O. conspicuus*, but both sexes of that species vary considerably in colours and structure, and I can only regard the type in question as a rather dingy female of it.

### **ONTHOPHAGUS VICTORIENSIS Blackb.**

*O. jungi* Blackb.

Plate viii, figs. 51, 52.

The type of *O. victoriensis* is represented in the South Australian Museum by a fragment (its head and prothorax are missing). It belongs to the species subsequently named *O. jungi*, and of which Mr. J. C. Goudie mounted sexes on one card from Birchip, Victoria.

**ONTHOPHAGUS TAMWORTHI Blackb.**

Of this species two specimens, sexes, were known to Blackburn. The male is now in the British Museum, but the female is before me; they were both badly abraded and dull, and were described as "*supra glaber . . . minus nitidus, coriaceus.*" Two specimens from Collarenebri (New South Wales) quite evidently belong to the species: they have the prothorax shining and the upper-surface conspicuously clothed; on the prothorax the hairs are erect, fairly dense, and in parts almost as long as the distance between the cephalic carinae, but they are absent from the slightly depressed median space; there are fairly numerous hairs on the head, except behind the interocular ridge (the ridge on the male, as viewed from behind, appears to be moderately arched forwards, and rather acutely and evenly elevated); on the elytra the hairs are sparser and less erect, and from behind appear in two regular rows on each interstice. The male, from Collarenebri, is 6 mm., the female 5 mm.; the female has an obscure purplish gloss, instead of an obscure greenish one.

**ONTHOPHAGUS LEAI Blackb.**

Plate vii, figs. 28, 29.

The interocular ridge on this species varies considerably; it is usually about two or three times as wide as high, with the top even, but the middle of the ridge is often triangularly elevated; on one specimen from Bathurst (New South Wales) the ridge is much higher than usual, with its summit conspicuously trifold. The prothoracic horns project forward much as on *O. ferox*, but are wider and flatter. Specimens are often attracted to lights.

**ONTHOPHAGUS COMPEREI Blackb.**

Plate viii, figs. 53-56.

The cephalic horns on the males of this species vary considerably in size: on some they are subconical, rather short, and almost simple; on one specimen they are long, curve inwards at the summit, and are slightly dentate, both internally and externally.

**ONTHOPHAGUS HOPLOCERUS sp. nov.**

Plate viii, figs. 57, 58.

♂ Black, antennae and tarsi reddish, club paler. Under-surface and legs with rusty-red hairs.

Head wide, sides behind clypeal suture slightly dilated, and then strongly narrowed to base; two rather narrow and almost vertical horns between eyes,

each horn near an eye and with a strong tooth at its inner basal third, between the two horns a rather narrow notched elevation, slightly higher than the teeth of the horns; between the horns and the clypeal suture with sparse and small punctures, elsewhere with dense and fairly coarse ones. Clypeus moderately elevated and almost truncated in front, thence strongly dilated and with a slight incurvature to near base, the sides for a short basal space almost parallel, suture earinated and trisinuate, the median sinus wider than the others combined. Eyes very narrow, with distinct facets. Prothorax wide, front portion retuse, with a slight median swelling; with fairly large, dense, and sharply defined punctures, smaller and sparser on parts of the retuse portion than elsewhere, sides considerably dilated near middle, where they are wider than elytra, front angles moderately acute, hind ones widely rounded off, margins narrow and distinct throughout; lateral foveae rather large and with distinct punctures; median line shallow, but distinct on basal half. Elytra shagreened and opaque; striae very narrow, shining, and with distant punctures; interstices with small, subobsolete punctures, becoming larger but still shallow on sides. Pygidium with sharply defined punctures, slightly smaller than on prothorax. Metasternum with large and small irregularly distributed punctures. Length, 10.5–11.5 mm.

♀ Differs in having the head smaller, with the sides from the widest part (level with the front of the eyes) obliquely decreasing, with a slightly rounded outline to the front of the clypeus, which is much less elevated, the punctures on the clypeus are coarser and mostly confluent, the space between it and the interocular ridge has coarse and dense punctures, and the ridge is shining, almost impunctate, and but feebly elevated; the prothorax is less dilated on the sides and scarcely retuse in front, the elytra are less opaque, and with larger punctures, and the front legs are shorter, with wider tibiae and stouter teeth.

*Hab.* Victoria: Alps (H. W. Davey). Type, I. 15394.

Readily distinguished from all other species known to me, except *O. comperci* and *O. victoriensis*, by the horn near each eye of the male being compound; on some males of the former species the horn is dentate outwardly as well as inwardly, and its head is without the conspicuous notched median process; on the male of the latter species there is a small conical projection between the horns, the clypeus is deeply notched in front, and the elytra are very different. The head of the male, at first glance, has a curiously angular appearance, almost octagonal. In describing the shape of the eyes of this and other species their upper surface is referred to; the lower parts of all the species I have examined are large and convex, more or less globular.

Mr. F. E. Wilson has recently taken (at Lakes Entrance, Victoria) three specimens that appear to belong to the species; a female agrees perfectly with

one taken by Mr. Davey, but two males have the horns greatly reduced in size, still nearer vertical, and with the tooth on each smaller, although quite distinct; the median elevation is reduced to appear as two almost equilaterally triangular processes joined at the base, rather than a single bifid elevation.

**ONTHOPHAGUS MAMILLATUS** sp. nov.

Plate ix, fig. 71.

♂ Black, subopaque; antennae, palpi, and tarsi dull reddish, club paler. Under-surface and legs with more or less rusty-red hair.

Head rather large, sides behind clypeal suture slightly dilated and then strongly narrowed; interocular ridge narrow and with three small prominences, of which the median one is the largest; between the ridge and the clypeal suture polished and with smaller punctures than elsewhere. Clypeus with sides strongly narrowed and slightly incurved from base to apex, which is gently rounded and strongly upcurved; hind suture carinated, the median portion straight and wider than the combined width of the sides; with fairly dense and sharply defined punctures at apex and sides separated by vermiculate ridges. Eyes rather narrow, facets fairly distinct. Prothorax rather large, front portion retuse; with two fairly acute processes rather close together at apical third, a shallow median line from between them to base; sides strongly dilated, front angles obtusely pointed, hind ones very wide; margins and marginal gutter distinct throughout, but enfeebled about hind angles; punctures rather sharply defined only about lateral foveae, where they are of moderate size, elsewhere although not minute they are very ill-defined, and completely vanish in some parts. Elytra shagreened, with small and indistinct punctures; striae very narrow, shining, and with distant punctures. Pygidium shagreened, and with rather feebly defined punctures. Metasternum with dense, asperate punctures on sides, becoming sparser and more sharply defined about middle. Apical segment of abdomen strongly narrowed to middle. Length, 10-13 mm.

♀ Differs in having the head smaller, with the sides narrowed from nearer the base, clypeus with vermiculate ridges throughout (except on the elevated margins), prothoracic tubercles smaller, apical segment of abdomen very slightly narrowed in middle, and front tibiae slightly shorter, with wider teeth.

*Hab.* Queensland: Mount Tambourine (H. Hacker, H. Pottinger, and A. M. Lea). Type, I. 3750.

The prothoracic processes of the two males appear rather acute from above, but from the sides they are seen to be flattened, with the front edge almost vertical; when seen from behind each appears to overhang a space halfway between the median elevation of the interocular ridge, and one of the side ones. Of seven

females, two large ones have the prothoracic tubercles as large as on the males, although more obtuse, five small ones have them smaller and more obtuse; the large females also have the interocular elevations longer and more acute than on the males, the median one appearing as a short horn about half the length of the clypeus. The two large females have the appearance, in comparison with all the others, of being males, but the shape of the apical segment of the abdomen renders it certain that they are females, and that the two smaller ones are males. The elytra are somewhat as on *O. macrocephalus*, *O. declivis*, and *O. schmeltzi*, but the head and prothorax are very different from those of those species, or of any other before me.

**ONTHOPHAGUS ANCHOMMATUS** sp. nov.

Plate ix, fig. 72.

♂ Black, shining, parts of head and of legs obscurely reddish, antennae, palpi and tarsi paler, club and several of the preceding joints flavous. Under-surface and legs with hairs varying from almost white to rusty-red.

Head with rather sparse but sharply defined punctures on basal half, interocular ridge narrowly elevated in middle, each side elevated into a rather wide subtriangular horn. Clypeus with suture strongly trisinate, the median sinus strongly carinated, arched forwards, and wider than the others combined, sides in front of suture subparallel for a short distance, then strongly incurved to apex, which is gently rounded and strongly elevated; punctures rather sparse in middle and more numerous on sides. Eyes very narrow and with distinct facets. Prothorax slightly wider than elytra, a wide median process, widely triangular in front, overhanging head, a vague median line on basal half; apex and sides narrowly margined, base depressed and immarginate; punctures dense, rather large, and sharply defined, densest of all on apex of process. Elytra with narrow striae, interstices moderately convex and with fairly large sharply defined punctures, denser on sides than elsewhere. Metasternum with fairly large and dense punctures on sides, becoming sparser and mixed with small ones in middle. Apical segment of abdomen very narrow in middle; pygidium with large, crowded punctures. Length, 7.5–8.5 mm.

♀ Differs in having the head smaller, the interocular ridge with a wide triangular elevation in middle, as well as with short lateral horns; clypeus smaller, apex less strongly upturned (although more strongly than is usual in females of the genus), with dense punctures, mostly transversely confluent (or vermiculate); prothorax with median process almost straight in front, not overhanging head, and narrowed to its base, apical segment of abdomen scarcely narrowed in middle, and front tibiae shorter and wider with wider teeth.



*Hab.* Queensland: Brisbane, in November and January (H. Hacker). Type, in Queensland Museum; cotype, I. 15400, in South Australian Museum.

An isolated species, at first glance approaching *O. latro*, but head and prothorax very different. The clypeus of the male is so strongly elevated in front than if the elevated part were bent backwards it would touch the middle of the suture. The cotype male has the medio-apical process of the prothorax intermediate in shape between that of the type male and its female.

**ONTHOPHAGUS TRICAVICOLLIS** sp. nov.

Plate ix, figs. 73, 74.

♂ Black, shining; head, except clypeus, and prothorax, except projecting parts, coppery-green; antennae, palpi, and tarsi obscurely reddish; club and some of the preceding joints flavous. Under-surface and legs with more or less rusty-red hair.

Head rather large, sides angularly dilated in middle, between clypeal suture and interocular ridge, with small and sparse, but sharply defined punctures, becoming larger on sides, behind the ridge almost impunctate; ridge narrow, near each eye briefly subtriangularly elevated. Clypeus with suture carinated and very feebly sinuous, sides strongly obliquely narrowed to apex, which is strongly elevated and almost truncated; with sparse and minute punctures in middle, becoming larger and more numerous but not dense on sides. Eyes rather narrow and with distinct facets. Prothorax large, distinctly wider than head: a large trilobed mass in front, the lobes rounded on their upper parts, almost vertical in front, and not at all greenish; a large excavation between them and each side, the excavation with an overhanging subconical tubercle near the lateral fovea, which opens in front into the excavation; front angles distinctly produced but truncated; sides narrowly margined and with a narrow gutter, base almost immarginate; median line very feeble; with fairly numerous and rather feeble punctures, more sharply defined about the lateral foveae than elsewhere, and absent from most of the excavated parts. Elytra with narrow striae, interstices moderately convex, with fairly numerous and small but distinct punctures. Metasternum opaque and with fairly dense punctures, except in middle, which is shining and with a few large and some very small ones. Three apical segments of abdomen narrowed in middle; pygidium subopaque and with irregular punctures. Front tibiae long. Length, 9-12 mm.

♀ Differs in having the head smaller, less dilated in middle, interocular ridge evenly elevated throughout, many distinct but small punctures behind it, clypeus smaller, less elevated in front, and closely transversely vermiculate; prothorax with four small dark tubercles at summit of the frontal slope, the two

median ones more distant from each other than from the others, the space between them and the apex scarcely depressed, but slightly excavated in front between them and the others, the excavated parts almost impunctate, elsewhere with more distinct punctures than on the male; apical segment of abdomen scarcely narrowed in middle and front tibiae considerably shorter, with wider teeth.

*Hab.* Queensland: Coen River (W. D. Dodd), Mulgrave River (H. Hacker), Cairns (A. M. Lea), Bowen (Aug. Simson). Type, 1. 3775.

In many respects like *O. conspicuus*, but the elytra are not at all metallic and not smoothly shagreened; on the male the clypeus is much less notched in front than on that species, the median projections of the prothorax look very different from in front, the front angles are truncated, and the front legs are considerably longer. The middle of the metasternum usually has a distinct greenish gloss, and there is usually a faint greenish gloss on the abdomen and legs. The clypeal suture, when seen directly from above, appears almost straight throughout. In addition to the fairly sharp punctures on the elytra, there are others more or less obliquely conjoined, giving the appearance of briefly oblique strigosity. One male has the prothorax with rather larger punctures than usual, and with a small fovea near the middle of its base, its clypeal suture is also more distinctly sinuous than on the other males, although it is not trisinuate. On females in good condition the interocular and clypeal ridges have a golden gloss.

### **ONTHOPHAGUS BICAVICOLLIS sp. nov.**

Plate viii, fig. 59.

♂ Black; head (except front of clypeus) and prothorax bright metallic green, some of the elevated parts coppery; elytra and pygidium purplish, in some lights greenish, parts of legs obscurely diluted with red, antennae flavous; pygidium and under-surface sparsely clothed, upper-surface glabrous.

Head strongly dilated in front of eyes; with fairly large and dense (sometimes confluent) punctures between clypeal suture and interocular ridge, the ridge feebly elevated and strongly arched forwards, behind it with rather sparse and small punctures. Clypeus with suture carinated throughout, the carina oblique on sides, the median part four times as wide as each of the lateral parts; sides with margins rapidly rising to apex, strongly elevated and slightly incurved at middle; punctures at base more transversely confluent than behind the suture, becoming small and sparse in front. Eyes narrow, with distinct facets. Prothorax wide, sides strongly rounded, front angles strongly produced and somewhat sinuous, hind ones rounded off; a large excavation on each side of apex, each excavation with a subtriangular tubercle overhanging its base, and inwards with

an obtuse ridge (the space between the two ridges gently concave); with large, coarse punctures on sides, smaller and sparser, but still large, elsewhere, but absent from the excavations; median line rather wide and shallow; gutters fairly deep on sides, shallow at base. Elytra deeply and narrowly striated, the interstices separately distinctly convex, and with large punctures, usually with an oblique or transverse impression. Metasternum shagreened, and with rather small, asperate punctures on sides, middle shining and with small punctures, but with a few large ones near coxae. Two apical segments of abdomen strongly narrowed to middle; pygidium with large and small punctures intermixed. Front tibiae long, thin, and strongly arched near apex. Length, 11 mm.

*Hab.* Northern Territory: thirty miles east of Darwin (G. F. Hill). Type, I. 15501.

By its strongly narrowed apical segments of abdomen, and long front legs, the type certainly appears to be a male, although the projections and excavations of the pronotum approach those of some females of *O. conspicuus*, and some allied species; the elytra, however, are very different from those of *O. conspicuus*; from *O. tricavicollis* it differs in the feeble interocular elevation, and considerably larger and sparser elytral punctures; the shape of the prothorax and its punctures seem intermediate between those of the sexes of the latter species. Seen directly from above, the prothorax appears to have two small tubercles and two larger obtuse ones, the distance between the latter being equal to that between the eyes; viewed from behind, so that the head just disappears, the front appears to be 5-sinuate, the median sinus twice the width of each of the intermediate ones, and these much wider than the lateral ones.

### ONTHOPHAGUS SPISSICOLLIS sp. nov.

Plate ix, fig. 75.

♀ Black, subopaque, in parts with a bronzy gloss; basal joints of antennae, parts of palpi and of tarsi obscurely reddish. Under-surface and legs with hairs varying from almost white to dark brown; head and most of prothorax with short, dense, upright, brownish setae; elytra with paler, shorter, and sloping setae, confined to one or two rows on each interstee.

Head wide, densely and coarsely punctate and subvermiculate, except behind interocular ridge, this acute in middle and strongly elevated at each side, but not horned; sides moderately elevated, slightly incurved at clypeal suture, and conspicuously produced on each side of a deep apical notch; clypeal suture trisinate, finely carinated, the median portion feebly arched forward, and slightly elevated in middle. Eyes very narrow, facets distinct. Prothorax with front angles obtusely produced, margins distinct throughout, but slightly higher

on sides than elsewhere; with a feeble, obtusely pointed ridge in middle, about one-fifth from apex; with dense and coarse punctures, the intervening spaces with small punctures, a shagreened space without distinct punctures along middle from near the subapical ridge to base, and continued along each side at base, and on the side to near the sublateral fovea, each of these rather narrow and deep. Elytra with narrow, shining, geminate striae, with distant punctures, the interstices finely shagreened and with small, distant, setiferous punctures. Metasternum with irregularly distributed punctures of rather large size, with some small ones scattered about. Apical segment of abdomen not narrowed in middle; pygidium shagreened and feebly punctate. Length, 6–7 mm.

*Hab.* Western Australia: Beverley (F. H. du Boulay), Mount Barker (S. Macsorley). Type, I. 3774.

With the general appearance of the female of *O. adalaidae*, but differs in the interocular elevation, clypeal suture, prothorax with shagreened base and part of median line, medio-frontal prominence, etc.; in some respects it seems nearer to the female of *O. haugi*, but the elytra are without the conspicuous irregular series of elongated subgranular elevations of that species. On the prothorax, head, and elytral suture of the type the bronzy gloss is very conspicuous, but on the second specimen it is but slightly in evidence.

### ONTHOPHAGUS VARIANUS sp. nov.

Plate ix, fig. 76.

♀ Black, shining; antennae, palpi, tarsi, and front coxae reddish, club paler; head (except clypeus) and prothorax coppery-green, elytra at base and sides reddish. Under-surface and legs with whitish and reddish hairs, sides of elytra with a few setae.

Head with sides angularly dilated in middle, interocular ridge in the form of a strong and almost evenly elevated carina; between it and clypeal suture with sharply defined punctures, of moderate size but not very dense, becoming denser on sides. Clypeus with sides but feebly elevated, apex almost truncate, surface densely transversely vermiculate; suture carinated and trisinuate, median sinus very feebly arched, about three-fifths of the total. Eyes very narrow, facets distinct. Prothorax large, sides strongly dilated, front angles (as seen from directly above) almost rectangular, margins and gutters distinct on sides, less distinct on apex and feeble at base; apical third with two large hollows, surmounted by three obtuse processes; parts of the hollows with large and fairly dense punctures, somewhat similar punctures on sides, rest of the surface with sparse and small punctures, and very minute ones; median line fairly distinct on basal half, sublateral foveae rather large. Elytra with narrow striae containing

distant punctures, these also partially impressed on the interstices at each side of a stria, interstices elsewhere with sparse and small punctures, but becoming larger on sides. Metasternum with dense and rather large punctures on sides, with a few large ones and minute ones elsewhere. Apical segment of abdomen not narrowed in middle; pygidium with rather coarse, crowded punctures. Length, 8.25 mm.

*Hab.* Queensland: Bowen (Aug. Simson). Type, I. 15410.

A beautiful species, the size of *O. rufosignatus*, but the red parts of elytra basal and lateral instead of apical, and the prothorax not at all reddish; *O. rubrimaculatus* is a much smaller species, with shagreened elytra, etc. The reddish parts of the elytra are wide at the base, widest of all on the shoulders, and narrowed on the sides to the apex; from some points of view they appear to form an irregular M. The prothorax appears to be scooped out, and with a few setae on each side of the middle in front, with the processes at the summit of the scooped-out parts not specially elevated or produced.

### **ONTHOPHAGUS FLAVOAPICALIS sp. nov.**

♂ Black, shining, most parts with a distinct bronzy gloss, antennae, palpi, and tarsi reddish, club flavous; elytra with flavous mottlings about base and apex, or on apex only. Under-surface and legs rather sparsely clothed, a few sub-marginal setae on elytra.

Head with interocular ridge very feebly elevated and slightly curved; space between it and clypeal suture with rather sparse and small, but sharply defined punctures. Clypeus with crowded punctures, sides rather lightly elevated, apex distinctly notched, suture with median part almost straight, distinctly carinated, and equal to the two side parts. Eyes rather narrow, facets distinct. Prothorax with sides strongly and almost evenly rounded, front angles subacutely produced, hind ones widely rounded; sides very finely margined, apex still more finely, base not at all; median line feebly traceable at base and again near apex; punctures of small or medium size, and sharply defined, but not crowded, smaller and sparser in middle near apex than elsewhere; sublateral foveae rather small. Elytra with rather narrow geminate striae, with transverse distant punctures, interstices separately convex, faintly rugulose, with fairly numerous and rather small punctures, not very deep but quite distinct and becoming rather coarse on sides. Metasternum with fairly dense and large punctures, becoming sparser and mixed with small ones in middle. Apical segment of abdomen distinctly narrowed in middle; pygidium with dense and fairly large punctures. Length, 5-6 mm.

♀ Differs in having the interocular ridge even less distinct, prothorax smaller, less convex in front, and without trace of a median line except at extreme base, and apical segment of abdomen less narrowed in middle.

*Hab.* Western Australia: Geraldton (J. Clark). Type, **M.** 15415.

With the general appearance of *O. blackwoodensis* and *O. pontilis*, but head of male unarmed, *O. incornutus* has very different punctures on prothorax and elytra, etc.; *O. macleayi*, which is similarly coloured, is larger and with the sculpture of head and elytra different. The bronzy gloss is very faint on the elytra, and on two females the gloss there is slightly greenish. Each of the five specimens before me has distinct markings at the apex of elytra; on two of these the base is immaculate, on two (one of each sex) there is a spot inwards of each shoulder, and on the other (a small female) there is an obscure spot at the base of most of the interstices.

### **ONTHOPHAGUS CRIBRICOLLIS sp. nov.**

Plate ix, fig. 77.

♂ Black, palpi and parts of tarsi reddish, antennae flavous, head (except clypeus and elevated parts, which are bronzy) and prothorax dark metallic green. Under-surface and legs sparsely hairy.

Head with dense, moderately large and sharply defined punctures, becoming transversely confluent or vermiculate on clypeus; interocular ridge wide, acute and even on top, but the sides abrupt, punctures behind ridge sparser than elsewhere; sides conspicuously angulate. Clypeus with oblique slightly elevated sides, apex strongly elevated and slightly notched, suture carinated throughout, median two-thirds almost straight. Eyes narrow, with distinct facets. Prothorax large, sides strongly rounded, front angles rather acute and produced slightly outwards, margins rather narrow throughout, with four obtuse elevations across middle about one-fourth from apex; punctures large and crowded, but nearly all round and sharply defined. Elytra with narrow striae containing distant transverse punctures, interstices shagreened and opaque, with small subobsolete punctures, becoming more distinct on sides. Metasternum with rather small and irregularly distributed punctures. Abdomen with apical segment strongly narrowed to middle. Front tibiae elongate. Length, 8 mm.

*Hab.* Northern Territory: Daly River (H. Wesselman). Type, **I.** 15419.

Apparently nearer to *O. conspicuus* than to any other species, but the opaque black elytra and coarse punctures of prothorax and head should be distinctive, even if the prothoracic tubercles should be variable, as they certainly are on that species. I know of no Australian species (except several of the *O. pentacanthus* group, in which in parts they are larger) with coarser punctures on the pro-

thorax; on *O. haagi* they are even denser, but are not as large; on *O. rugosus* the prothorax is much rougher, but the roughness is due to irregular elevations; on the present species it is due to punctures. The medio-frontal elevations of the prothorax are very feeble, especially the two median ones, which appear to be little more than irregular ridges between a few punctures; the median line is invisible from above, but from in front the prothorax appears to be vaguely depressed along the middle. In some lights, parts of the under-surface have a faint greenish or purplish gloss.

### ONTHOPHAGUS CLYPEALIS sp. nov.

Plate ix, fig. 78.

♂ Black, shining, in parts with a slight bronzy gloss, antennae, palpi, and tarsi reddish, club paler. Under-surface, legs, pygidium, sides and apex of prothorax, and parts of head, with rusty-red hairs; elytra with a row of shorter and paler subdepressed hairs or setae on each interstice.

Head moderately large, with a rather short, subconical, and somewhat sloping horn near each eye; between the horns and the clypeal suture distinctly concave, and with rather small but distinct punctures. Clypeus with fairly numerous sharply defined punctures of moderate size, with larger setiferous ones scattered about; sides evenly rounded and slightly margined, the margins moderately elevated, becoming more elevated and almost truncated in front; suture trisinate, median sinus carinated, arched forwards, and about once and one-third the width of each of the others, which are oblique. Eyes narrow, with distinct facets. Prothorax rather wide, front slightly retuse and with a feeble median lobe, sides and apex finely margined, base not; with rather sparse, sharply defined punctures, small in middle, and larger, but not coarse, elsewhere; median line vaguely defined. Elytra with narrow, geminate striae, containing rather distant, transverse punctures; interstices with irregular rows of fairly large, distant punctures. Metasternum with rather large, sharply defined punctures; near the coxae mixed with some smaller ones. Apical segment of abdomen distinctly narrowed to middle; pygidium with rather large and sparse punctures. Length, 7-8 mm.

♀ Differs in having the interocular horns reduced to slight prominences, connected by a feeble ridge, the concave space shallower and with coarser punctures; clypeus slightly notched in front, with denser punctures, its suture more elevated in middle; prothorax not retuse in front, without trace of a feeble median lobe, hairs not continuous across apex, and apical segment of abdomen not narrowed in middle.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15399.

I know of no closely allied species; the cephalic horns are placed somewhat

as on *O. mutatus*, but the space between them is conspicuously concave, and the elytral punctures are very different. On the male there are some obscurely reddish spots on the base, apex, and sides of the elytra, on the female on the apex only. The elytral punctures in places appear to be in irregular double rows, elsewhere in single rows, many of them have a granulated appearance, and each contains a seta; although the surface is not distinctly wrinkled it is slightly rugose, more noticeably on the female than on the male. The front tibiae do not appear to differ in the sexes.

**ONTHOPHAGUS MICROTRICHUS sp. nov.**

♂ Black, shining, palpi and legs more or less reddish, antennae flavous. Under-surface and legs with sparse hair and short setae; elytra and sides of prothorax with sparse pubescence, or short depressed setae.

Head flat and almost impunctate between eyes, then with rather small sharply defined punctures to clypeal suture. Clypeus short, sides feebly elevated, more strongly so and almost truncated in front, with denser and larger punctures than on rest of head, and in places feebly confluent; suture strongly elevated and carinated in middle, its sides somewhat oblique and narrowly impressed. Eyes narrow, with distinct facets. Prothorax slightly wider than head, front angles obtusely produced, sides moderately margined, apex and base feebly so, the margin vanishing in middle of base; apical fifth or sixth vertical in middle, with two small, flat prominences above; median line shallow about base, and traceable to middle; punctures of moderate size, sharply defined and numerous, but not crowded, very small on retuse portion. Elytra with narrow, sub-geminate striae, containing distinct punctures; interstices separately convex, with numerous somewhat rugose but sharply defined punctures, and in places briefly obliquely strigose. Metasternum opaque and with asperate punctures on sides, shining and with small punctures in middle. Apical segment of abdomen strongly narrowed in middle. Front tibiae rather long. Length, 6–7 mm.

♀ Differs in having a feeble bilobed elevation between the eyes, clypeus moderately notched in front, its suture less elevated in middle; prothorax smaller, not vertical in front, without medio-apical prominences; apical segment of abdomen scarcely narrowed in middle, and front tibiae shorter.

*Hab.* Queensland: Cape York (H. Elgner), Cairns (E. Allen). Type, I. 3783.

The general outlines are somewhat suggestive of *O. nucleayi*, *O. queenslandicus*, and *O. comperci*, but the head is very different. The prothorax of the male, as seen from behind, appears to have the whole apex trisinuate, the median sinus smaller than the others. On several females the sides of the clypeus are obscurely reddish.



more upturned in front than on the female, its surface obsoletely vermiculate, and prothorax with the frontal impressions very feeble; a still smaller male is obscurely reddish, with a vague greenish gloss on the head and prothorax, the interocular elevations feeble, clypeus as on the preceding male, and frontal impressions of prothorax absent.

**ONTHOPHAGUS CUPREOPUNCTATUS** sp. nov.

♂ Black, with a greenish gloss, becoming purplish or bronzy on head, antennae, palpi, and tarsi somewhat reddish, club somewhat piecous, with greyish pubescence. Under-surface and legs rather sparsely clothed.

Head with interocular ridge obtuse in middle, each side appearing as an obtuse subtriangular elevation; in middle a fairly large round fovea, a few conspicuous punctures in front of eyes. Clypeus with sides gently rounded and moderately upcurved, apex moderately notched: with fairly dense, sharply defined punctures in front, becoming feeble posteriorly; suture not traceable across middle, but distinct on sides. Eyes very narrow, facets distinct. Prothorax moderately wide, evenly convex, lateral gutters and margins narrow, apical margin very narrow, basal absent; punctures nowhere crowded, but more numerous on sides than elsewhere, and rather small but sharply defined. Elytra with narrow, geminate striae; interstices not separately convex, with fairly numerous, small punctures, becoming larger on sides. Metasternum with fairly large punctures on sides and apex, becoming sparse and small in middle. Abdomen with apical segment distinctly narrowed in middle; pygidium with rather dense punctures. Length, 4.5-5 mm.

♀ Differs in having the head with denser and coarser punctures, especially on clypeus, interocular ridge very feeble, even on sides, median fovea shallower, clypeal suture carinated throughout, the median portion straight and about three-fourths of the total; prothoracic and elytral punctures somewhat larger; apical segment of abdomen not narrowed in middle, and front tibiae distinctly shorter, with stouter teeth.

*Hab.* New South Wales. Type, I. 15421.

I have seen specimens of this species named as *O. nitidior*, but they differ from that species in being smaller, with the gloss mostly greenish instead of purplish, and both sexes concave between the eyes; the size, colours, and general outlines are somewhat as on *O. negatorius*, but the head, elytra, and legs are all very different. The prothoracic punctures in some lights have a distinct coppery-purple gloss.

**ONTHOPHAGUS BICARINATICEPS** sp. nov.

♂ Black, elytra castaneous, antennae, palpi, and tarsi reddish, club piceous, with greyish pubescence. Under-surface and legs sparsely clothed; upper-surface with sparse, erect setae, shorter and less erect on elytra than elsewhere.

Head with interocular ridge narrow, straight in middle, curved near each eye; behind it (except at base, which is impunctate) and at the sides with fairly large punctures, between it and clypeal suture with somewhat smaller and more crowded ones. Clypeus with sides and apex moderately upturned, the apex rather lightly emarginate; surface with dense and rather small, but sharply defined punctures, interspersed with large ones; suture in three parts, the median part carinated, curved slightly forwards, and three-fourths of the total. Eyes very narrow, with distinct facets. Prothorax rather large, evenly convex, sides with narrow gutters and margins, apex and base very finely margined; with fairly numerous, sharply defined punctures of moderate size. Elytra with narrow geminate striae containing distant punctures, which impinge on interstices; interstices separately convex, with irregular rows of distinct, distant punctures, becoming larger on sides. Metasternum with dense and fairly large punctures at sides and margining coxae, becoming sparse and small in middle. Abdomen with apical segment strongly narrowed to middle; pygidium with somewhat crowded punctures. Length, 3–3.5 mm.

♀ Differs in having somewhat larger punctures, sides of clypeus less upturned, apical segment of abdomen not narrowed in middle, and front tibiae somewhat shorter and stouter.

*Hab.* New South Wales. Type, I. 15408.

The minute size, bicarinated head, clypeus emarginate in front, and dark club associate this species with the description of *O. granum*, but the smallest specimen is 3 mm., the elytra are more or less reddish and have distinct punctures on the interstices, the prothoracic punctures could hardly be regarded as coarse, although not very small, and the upper-surface is not glabrous; from *O. imponderosus* it differs in the clothing of the upper-surface, prothorax entirely black and with larger punctures, and elytral interstices separately convex; the cephalic ridges are somewhat as on *O. koebelei*, but the two species are otherwise very different. On the type male the head and prothorax have a bronzy gloss, on the type female greenish. Two females from Queensland (Cairns, Dr. J. F. Illingworth) have the head and prothorax purplish, the legs obscurely reddish, and the elytra vaguely infuscated about base and suture.

**ONTHOPHAGUS SUTILISTRIATUS** sp. nov.

♂ Black, head and prothorax with a slight metallic gloss, antennae, palpi,

and parts of legs reddish, club deeply infuscated. Under-surface and legs moderately clothed.

Head with interocular ridge very feeble and arched slightly backwards; between it and base with very minute punctures, between it and clypeus with fairly dense and sharply defined but rather small ones. Clypeus large, sides moderately elevated, apex slightly more elevated and almost truncated; punctures somewhat larger and more crowded on sides than elsewhere; suture in three parts, the median distinctly carinated, arched slightly forwards, and about three-fifths of total, side parts less distinctly carinated, and oblique. Eyes narrow and with distinct facets. Prothorax large, somewhat gibbous in front, sides strongly rounded, front angles produced slightly outwards, lateral margins and gutters moderate, apical ones slight, base almost immarginate; punctures of moderate size and sharply defined, although not deep, smaller and sparser about apex than elsewhere; lateral foveae fairly large and deep; median line very faint, but traceable almost throughout. Elytra with narrow shining striae, containing small, distant punctures; interstices shagreened, subopaque, feebly separately convex, and with very small punctures. Metasternum with irregularly distributed punctures, becoming sparse and small in middle. Abdomen with apical segment strongly narrowed in middle; pygidium with fairly dense but rather shallow punctures. Length, 8 mm.

*Hab.* Queensland: Bowen (Aug. Simson). Type, I. 15404.

At first glance approaching some forms of *O. consentaneus*, but interocular ridge arched backwards instead of forwards, the space between it and clypeus, and the clypeus itself, considerably longer; in general it is extremely close to a female placed (apparently correctly so) with *O. mastersi* by Blackburn, but the clypeus is more elevated in front and the abdomen of the type is distinctly masculine; *O. promptus* and *O. margaretensis* are more metallic, and have the intercarinal space on head, and the clypeus considerably shorter. The elytral striae have the appearance as of bearing stitches at regular intervals.

### ONTHOPHAGUS INTERRUPTUS sp. nov.

Plate ix, figs. 81, 82.

♂ Black, shining, head and prothorax with a slight bronzy gloss, antennae, palpi, and tarsi reddish, club flavous. Under-surface and legs with rather sparse clothing, but becoming dense on sides of sterna and parts of front legs.

Head wide, sides from near base almost semicircular, flat between eyes, except for short remnants of an interocular ridge; sides in front of eyes with a few punctures, but otherwise almost impunctate behind clypeus. Clypeus moderately elevated on sides, more strongly in front; with dense and fairly large

but shallow, subvermiculate punctures; suture carinated on sides, but obliterated in middle. Eyes large, facets inconspicuous. Prothorax large, sides strongly dilated in middle, then narrowed to apex, but with a sinuous outline, lateral margins and gutters comparatively wide, apical ones narrower, base almost immarginate, front angles obtusely produced, middle feebly produced; remnants of median line faintly visible; sides and apex with small, obsolete punctures, very minute ones elsewhere. Elytra with narrow, geminate striae, containing narrow, transverse, distant punctures; interstices shagreened, opaque, not separately convex, and with very minute punctures. Metasternum with dense, asperate, piliferous punctures on sides, running out at middle of apex, base with somewhat similar ones, middle shining and with minute punctures. Abdomen with apical segment strongly narrowed in middle; pygidium with numerous rather small punctures. Front tibiae elongate. Length, 10–10.5 mm.

♀ Differs in having the interocular ridge interrupted for a short distance only in middle, clypeus slightly notched in front, rather coarsely vermiculate, suture carinated across middle, prothorax evenly convex across apex, apical segment of abdomen not narrowed in middle, and front tibiae somewhat shorter.

*Hab.* Queensland: Bowen (Aug. Simson). Type, I. 15422.

With the general appearance of *O. glabratus*, *O. purchisoni*, and large *O. queenslandicus*, but readily distinguished therefrom by the interocular ridge and sides of prothorax; it is perhaps nearest of all to *O. pronus*, some specimens of which have the interocular ridge interrupted in the middle; it resembles several species of *Macropocopris*, but the claws are normal. On the female the clypeal suture is conspicuously carinated throughout, but each of the side parts, where it joins the median part, is attached to a carina that passes the front of an eye to join the outer end of the broken interocular ridge; on the male, owing to the absence of the median portion, the lateral parts appear to be suddenly directed backwards to the ends of the broken ridge. On both sexes the sides of the prothorax are not evenly rounded to the apex from their widest part, but have a slight (although quite distinct) incurvature between it and the apex; the front of the prothorax of the male could scarcely be regarded as retuse, but from behind it appears widely bisinuate.

### ONTHOPHAGUS OPACIPENNIS sp. nov.

Plate vii, fig. 30.

♂ Black, antennae, palpi, and tarsi reddish. Under-surface and legs with long rusty-red hair.

Head large; interocular ridge semicircularly arched forwards, each end elevated into a rather long and almost upright thin horn; behind the ridge concave

and almost impunctate, between the ridge and clypeus with sparse and minute punctures, the sides with rather dense ones. Clypeus semicircular, sides feebly and evenly elevated; with dense punctures, transversely confluent or vermiculate, except at base, where they are sparsely and separately impressed; suture trisinate and carinated throughout, median sinus slightly arched forwards, and about three-fifths of the total. Eyes moderately narrow, facets distinct. Prothorax large, sides strongly rounded and wider than elytra, front angles strongly produced and subacute, almost vertical and impunctate in front; the declivity crowned by four tubercles, the outer of these subconical and separated from the median ones by a shallow excavation, the median ones connected by a narrow ridge; median line wide and shallow, basal gutter shallower than lateral, and margin less elevated; with moderately large and dense, but not very deep punctures; sublateral foveae fairly deep. Elytra with narrow, geminate striae, containing transverse distant punctures; interstices shagreened and opaque, with small shallow punctures. Metasternum with dense, asperate punctures on sides, becoming larger and sparser about coxae, and small in middle. Apical segment of abdomen strongly narrowed to middle; pygidium shagreened and with fairly dense punctures. Length, 12-13 mm.

*Hab.* Queensland: Mount Tambourine, in October and December (H. Hacker), Blackall Range, in October (F. E. Wilson). Type, in Queensland Museum; cotype, I. 15437, in South Australian Museum.

A large species with prothoracic protuberances somewhat as in *O. pugnar*, but readily distinguished from that and all other large species by the interocular ridge and horns.

### **ONTHOPHAGUS STENOCERUS sp. nov.**

♂ Black or blackish, in parts with a faint bronzy gloss. Antennae, palpi, and tarsi reddish. Under-surface and legs with rusty-red hair.

Head large; with a long thin erect horn near each eye, the two without a connecting ridge; from base to clypeus with sparse and minute punctures, but becoming fairly large and dense on sides. Clypeus almost semicircular, sides slightly elevated, apex rather higher than sides; with fairly dense punctures at sides, but smaller and sparser in middle; suture trisinate, and carinated throughout, median sinus slightly arched forwards, and about three-fifths of the total. Eyes large, facets inconspicuous. Prothorax wide, sides strongly rounded, front angles strongly produced, lateral margins and gutters conspicuous, front ones feeble, basal absent; apical half obliquely sloping, and with sparse and minute punctures, elsewhere with slightly larger ones; sublateral foveae rather shallow. Elytra with narrow, geminate striae containing small distant punctures; inter-

stices shagreened and subopaque, with small, inconspicuous punctures. Metasternum with dense, asperate punctures on sides, sparse and small in middle. Abdomen with apical segment almost vanishing in middle; pygidium shagreened, opaque, and with fairly dense, small punctures. Length, 10–12 mm.

♀ Differs in having no horns on the head, the space between the eyes flat and marked in front by a straight carina-like edging, between this and the clypeus with larger punctures, although not very dense; clypeus closely transversely vermiculate almost throughout; prothorax less sloping in front, and with slightly larger punctures; apical segment of abdomen scarcely narrowed in middle, and front tibiae slightly shorter, with stouter teeth.

*Hab.* Queensland: Mount Tambourine and Brisbane (H. Hacker). Type, in Queensland Museum; cotype, female, I. 15438, in South Australian Museum.

Of other species with two long and more or less erect interocular horns in the male it is distinguished (apart from other features) by having much larger eyes than *O. tweedensis*, *O. australis*, *O. anisocerus*, and *O. mastersi*; *O. picipennis* has a strongly elevated ridge between the horns, and very different prothorax, *O. fitzroyensis* is considerably smaller, more metallic, with the prothorax as well as the elytra shagreened, and with somewhat larger punctures; the other species are all very much smaller. The largest female is almost entirely of a dingy reddish-brown.

### ONTHOPHAGUS PHOENICOCERUS sp. nov.

♂ Black, most parts with a bronzy gloss, antennae (except club, which is blackish), tips of palpi, and tarsi of a more or less dingy red. Under-surface and legs with long, whitish hair.

Head with a wide, flat, bifid horn between eyes; with dense and fairly large punctures. Clypeus with sides moderately elevated, middle more strongly elevated and deeply notched; suture distinct on sides but not traceable across middle. Eyes very narrow, with distinct facets. Prothorax with sides strongly rounded, front angles strongly produced and subacute, margins narrow on sides, still narrower at base and apex; apical third retuse; median line scarcely indicated; with crowded, sharply defined punctures, of moderate size and occasionally confluent. Elytra with narrow, shining, geminate striae, containing small, distant punctures; interstices shagreened, opaque, and with sparse, minute punctures. Metasternum with crowded, asperate punctures on sides, becoming larger and sparser about coxae, and minute in middle. Abdomen with apical segment strongly narrowed to middle; pygidium shagreened and opaque. Length, 7 mm.

*Hab.* Queensland: Brisbane, in November (H. Hacker). Type, in Queensland Museum.

At first glance apparently close to some forms of *O. haagi* (a species in which the interocular horn is very variable), but prothorax without medio-frontal projections, and elytra without granules or small tubercles on the interstices; the prothorax and elytra are sculptured much as on *O. adelaidae*. The process on the head of the type rises abruptly vertical, and with almost parallel sides, for a height about equal to half the distance between the eyes, its ends are then continued as narrow horns for rather more than one-third of the total height; there is a small node on its back part. From the sides the prothorax and elytra may be seen to have very short setae, but they are scarcely visible from most directions.

### **ONTHOPHAGUS COMPOSITUS sp. nov.**

♂ Black, most parts with a slight bronzy gloss; antennae (club blackish), palpi, and tarsi of a more or less dingy red. Under-surface and legs with rusty-red hairs.

Head with crowded and sharply defined punctures of moderate size; a small conical horn near each eye. Clypeus with sides moderately elevated, apex obtusely notched, suture trisinate and carinated throughout, median sinus almost straight and about three-fifths of the total. Eyes very narrow and with distinct facets. Prothorax with sides strongly rounded, front angles produced and acute, lateral margins narrow, front ones still narrower, basal absent; front somewhat gibbous; median line vaguely traceable near apex and at base; punctures and elytra as described in preceding species. Metasternum with dense, asperate punctures on sides, small, mixed with large ones, elsewhere. Abdomen with apical segment strongly narrowed in middle; pygidium shagreened and with dense punctures. Length, 7 mm.

*Hab.* Queensland: Stanthorpe (von Weildt). Type in Queensland Museum.

The sculpture of the prothorax and elytra approaches that of *O. adelaidae* and *O. phoenicocerus*, but the head is very different; the colour and cephalic horns are somewhat as in *O. granicollis*, but the prothorax is nongranulate; *O. spissicollis* has more rugosely sculptured prothorax and very different clypeus. On the sides of the elytra there are some very short setae, and none elsewhere, but the type may be partly abraded.

### **ONTHOPHAGUS SQUALIDUS sp. nov.**

♂ Black, in parts with a faint bronzy gloss; antennae, palpi, and tarsi reddish. Under-surface and legs sparsely clothed.

Head with dense and moderately large, subasperate punctures; a shallow depression in middle. Clypeus with sides rather lightly elevated, apex distinctly notched, with a small process on each side of the notch; suture in three parts, median part carinated and straight, lateral parts ill-defined. Prothorax evenly convex, sides strongly rounded and finely margined, front still more finely margined, base not at all; median line scarcely traceable; punctures crowded but sharply defined. Elytra with narrow, geminate striae, containing small, distant punctures; interstices shagreened, opaque, and with numerous small, shining granules. Metasternum with irregularly distributed punctures of various sizes. Abdomen with apical segment somewhat narrowed in middle; pygidium shagreened and opaque. Length, 5.5–6 mm.

♀ Differs in having the clypeus granulate-punctate, apical segment of abdomen not narrowed in middle, and tibial teeth larger and more acute.

*Hab.* Queensland: National Park, in December (H. Hacker). Type, in Queensland Museum.

With the general appearance of very small specimens of *O. carteri*, but the granules appear to rise evenly (although not in regular rows) from the elytra, which are finely shagreened and non-setose; on *O. granulatus* and *O. planicollis* the granules on the elytra are mostly confined to single rows, and the head and prothorax are very different; on *O. granicollis* the prothorax is densely granulate, and the elytral granules are smaller and setiferous. On the female the legs and metasternum are of a dingy red, but this may be due to immaturity; the margins of its clypeus are more strongly elevated than on the male, and the process on each side of the median notch is more prominent, but the male appears to be old and worn.

### ONTHOPHAGUS STRABONIS sp. nov.

♂ Black, shining, head and prothorax with a slight bronzy or bronzy-green gloss; antennae, palpi, and tarsi reddish, club blackish, but with grey pubescence. Under-surface and legs with rather sparse clothing.

Head with two obtusely triangular transverse elevations between eyes; between elevations and clypeal suture with rather small punctures, somewhat larger and more sharply defined on sides. Clypeus with sides slightly rounded and slightly elevated, apex scarcely more elevated and rather feebly notched; punctures sharply defined on sides, rather feeble about middle of base; suture not carinated, and feeble in middle, distinct on the sides. Eyes very narrow, with distinct facets. Prothorax moderately large, evenly convex, sides finely margined, apex and base still more finely; with numerous but not crowded, and sharply defined but rather small punctures. Elytra with fine geminate striae; interstices not separately convex, with rows of rather small but sharply defined



punctures, and larger ones cut across by striae. Metasternum with large punctures, becoming smaller but more sharply defined in middle. Abdomen with apical segment strongly narrowed in middle; pygidium with crowded and sharply defined punctures. Front tibiae rather long. Length, 4.5 mm.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15407.

Structurally near male of *O. quadripustulatus*, although cephalic armature not quite identical, but elytra with more distinct punctures and unspotted; from the male of *O. blackburni* it is distinguished by the noncarinated clypeal suture; the male of *O. sydneyensis*, also with the suture noncarinated, has the clypeus truncated in front and impunctate; *O. blackwoodensis* has much larger prothoracic punctures, head of male with one interocular elevation, etc. The front angles of the prothorax from above appear to be rather acute, but at right angles are seen to be almost rectangular.

### **ONTHOPHAGUS IMPONDEROSUS sp. nov.**

♂ Black, in parts with a slight bronzy or purplish gloss, legs and palpi reddish, antennae paler, sides of prothorax, most of elytra, and apical parts of abdomen obscurely reddish. Under-surface and legs sparsely clothed.

Head with a feebly elevated and almost straight ridge, almost touching the eyes; with small but rather distinct punctures behind it, and somewhat smaller, and sparser ones in front. Clypeus short, sides gently rounded and feebly upturned, middle feebly incurved and not more upturned than sides; punctures small and ill-defined, suture carinated and straight from side to side. Eyes narrow, with distinct facets. Prothorax wide and evenly convex, sides with narrow gutters and margins, apex more feebly margined, base scarcely visibly so; punctures of moderate size, numerous but not crowded, and sharply defined. Elytra with narrow striae; interstices not separately convex, with numerous small punctures, becoming larger on sides, where they are almost as distinct as those on prothorax. Metasternum with sharply defined punctures, larger on sides than elsewhere. Abdomen with apical segment distinctly narrowed in middle; pygidium with slightly larger and more crowded punctures than on prothorax. Length, 2.5 mm.

♀ Differs in having slightly larger punctures and apical segment of abdomen not narrowed in middle.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15409.

Smaller than any other species in the Museum, and apparently the size of *O. granum*, but club not dark, and clypeus scarcely emarginate, even in the female. The female has the elytra, except for a large space about the scutellum,

obscurely reddish, but the reddish parts not sharply limited; on the male the reddish parts are still more obscure; they are also very obscure on the prothorax.

**MACROPOCOPRIS KINGI Har. (*Onthophagus*).**

In Arrow's table of the species of *Macropocopris*, *M. kingi* is distinguished from *M. parvus* by its "Metasternum unpunctured." This appears to be the case with specimens when greasy, but when clean the metasternum is seen to have fairly numerous asperate punctures on the episterna, some shallow ones tending to obliteration on the sides and near the coxae, and very small ones in middle, but the largest ones are much smaller than those of *M. parvus*.

**MACROPOCOPRIS PARVUS Blanch. (*Onthophagus*).**

Plate ix, figs. 83, 84.

Specimens identified by Blackburn as *O. parvus* and agreeing with Arrow's table are before me: they all have the elytra shining and with minute but rather sharply defined punctures on a non-shagreened surface. In addition to differences in the front legs and abdomen, the sexes may be distinguished by the clypeal suture; in the female this is carinated across the middle as well as on the sides; in the male it is not so carinated, and on some specimens can scarcely be even traced. Mr. Tindale obtained 11, 6, 4 and 3 specimens from the anal region of the common wallaby of Groote Eylandt, *Macropus agilis*; they were running around the anus and amongst the fur; the natives said they were always to be found there; he obtained but one other specimen in ordinary collecting, but the species is common in collections from Cape York to North-western Australia.

A female from Port George IV (North-western Australia) differs from the normal form in having the elytra finely shagreened, and with still more minute punctures, not at all sharply defined; but these do not warrant its being described as a distinct species.

**MACROPOCOPRIS PERAMELINUS sp. nov.**

Plate ix, fig. 85.

♂ Black, shining, antennae, palpi, and tarsi somewhat reddish. Under-surface and legs with irregularly distributed, rusty-red hairs.

Head wide, sides from widest part almost semicircular and moderately elevated, more strongly so in front; obliquely flattened and almost impunctate between eyes, but with a small central fovea, with numerous small punctures elsewhere, becoming larger on clypeus, but nowhere very large. Clypeus with suture carinated on sides, but obsolete across middle, the side parts each joined

on to a thin carina that curves round to near the front of an eye. Eyes large, facets inconspicuous. Prothorax large, sides strongly rounded, lateral gutters fairly deep, margins fairly wide on sides, narrow at apex, but absent from base, front angles somewhat acute; a conspicuous conical tubercle in middle, crowning the summit of a fairly large, subapical depression; punctures very minute, becoming larger but obsolete in front angles. Elytra with narrow, geminate striae, containing narrow, distant punctures; interstices scarcely separately convex, and with minute punctures. Sides of prosternum, sides and base of metasternum, with rather dense piliferous, granulate punctures; metasternum with some large punctures near apex and small ones elsewhere. Abdomen with apical segment strongly narrowed in middle; pygidium with fairly dense small punctures. Claw-joints large, dilated to near apex, claws large and strongly arched at base. Length, 9 mm.

*Hab.* New South Wales: Wingham, one specimen from a bandicoot's nest (W. du Boulay). Type, I. 15396.

The general appearance is suggestive of species of *Onthophagus*, such as *O. glabratus* and *murchisoni*, with the prothorax armed, but the claw-joint and claws are those of *Macropocopris*; it is the only species at present known of that genus with the prothorax armed.

### **PEDARIA ALTERNATA sp. nov.**

♂ Black, shining, most parts with a bronzy gloss; antennae, palpi, and tarsi more or less reddish. With short, pale setae, rather sparsely distributed.

Head wide, moderately convex between eyes; with rather sparse punctures becoming dense (but normally concealed) at base, sides flattened but with fine margins. Clypeus with two projections marking the sides of a semicircular notch. Prothorax widely transverse, front angles obtusely produced, hind ones obtuse, sides obliquely decreasing from near apex to base; a large, almost impunctate, medio-basal depression, its front angles obliquely produced, between depression and sides with large, rather dense and suboblong punctures, elsewhere with sparser, smaller, and more rounded ones. Elytra feebly dilated behind shoulders; with deep, sharply defined striae, four interstices on each elytron conspicuously wider than the others, and each with a row of rather distant, setiferous punctures. Metasternum with a large median depression, connected with mesosternum by a median ridge; sides with dense and large punctures, smaller elsewhere, but all sharply defined. Front tibiae moderately long, obtusely tridentate externally, apex with a rather strong inner hook. Length, 4.5-5 mm.

♀ Differs in being less parallel-sided; head smaller, with denser and rather coarse punctures; prothorax with denser and larger punctures, and with man-

deep oblong ones in the large depression; front tibiae shorter, stouter, more dilated at apex, with larger and more acute teeth, and without an inner hook.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15433.

Consistently larger and more metallic than *P. geminata*, prothoracic excavation with distinct punctures only in the female, elytra nongranulate, etc. Numerous specimens were obtained on the island.

## EXPLANATION OF PLATES, vi-ix.

### Plate vi.

- Figs. 1, 2. *Canthonosoma macleayi* Har.  
 3, 4. *C. castelnaui* Har.  
 5. *Copraecus hemisphaericus* Guer.  
 6. *Labroma horrens* Sharp.  
 7. *Merodontus calcaratus* Mael.  
 8, 9. *Aulacopris reichei* White.  
 10, 11. *Coptodactyla ducalis* Blackb.

### Plate vii.

- Figs. 12-14. *Onthophagus laminatus* Mael.  
 15. *O. cowleyi* Blackb.  
 16. *O. pugnacior* Blackb.  
 17. *O. pugnax* Har.  
 18. *O. atrox* Har.  
 19, 20. *O. slounei* Blackb.  
 21, 22. *O. fissiceps* Mael.  
 23, 24. *O. ferox* Har.  
 25, 26. *O. pentacanthus* Har.  
 27. *O. pronus* Er.  
 28, 29. *O. leai* Blackb.  
 30. *O. opacipennis* Lea.

### Plate viii.

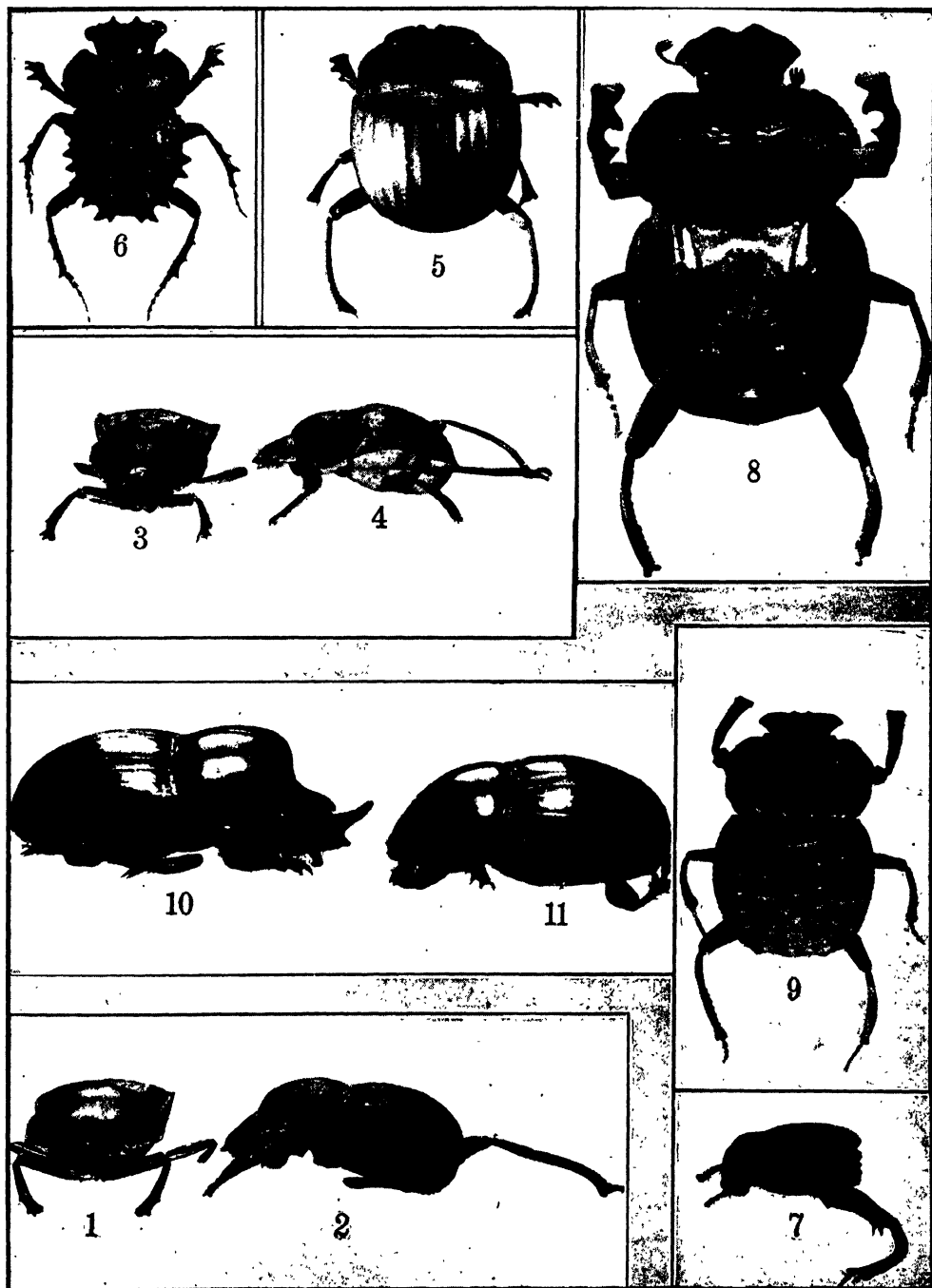
- Figs. 31-33. *Onthophagus australis* Guer.  
 34, 35. *O. mastersi* Mael.  
 36, 37. *O. macrocephalus* Kirby  
 38, 39. *O. conspicuus* Mael.  
 40, 41. *O. nodulifer* Har.

- 42-44. *O. haagi* Har.  
45-47. *O. anisocerus* Er.  
48, 49. *O. tweedensis* Blackb.  
50. *O. bovilli* Blackb.  
51, 52. *O. victoriensis* Blackb.  
53-56. *O. comperei* Blackb.  
57, 58. *O. hoplocerus* Lea.  
59. *O. bicavicollis* Lea.  
60. *O. variolicollis* Lea.

## Plate ix.

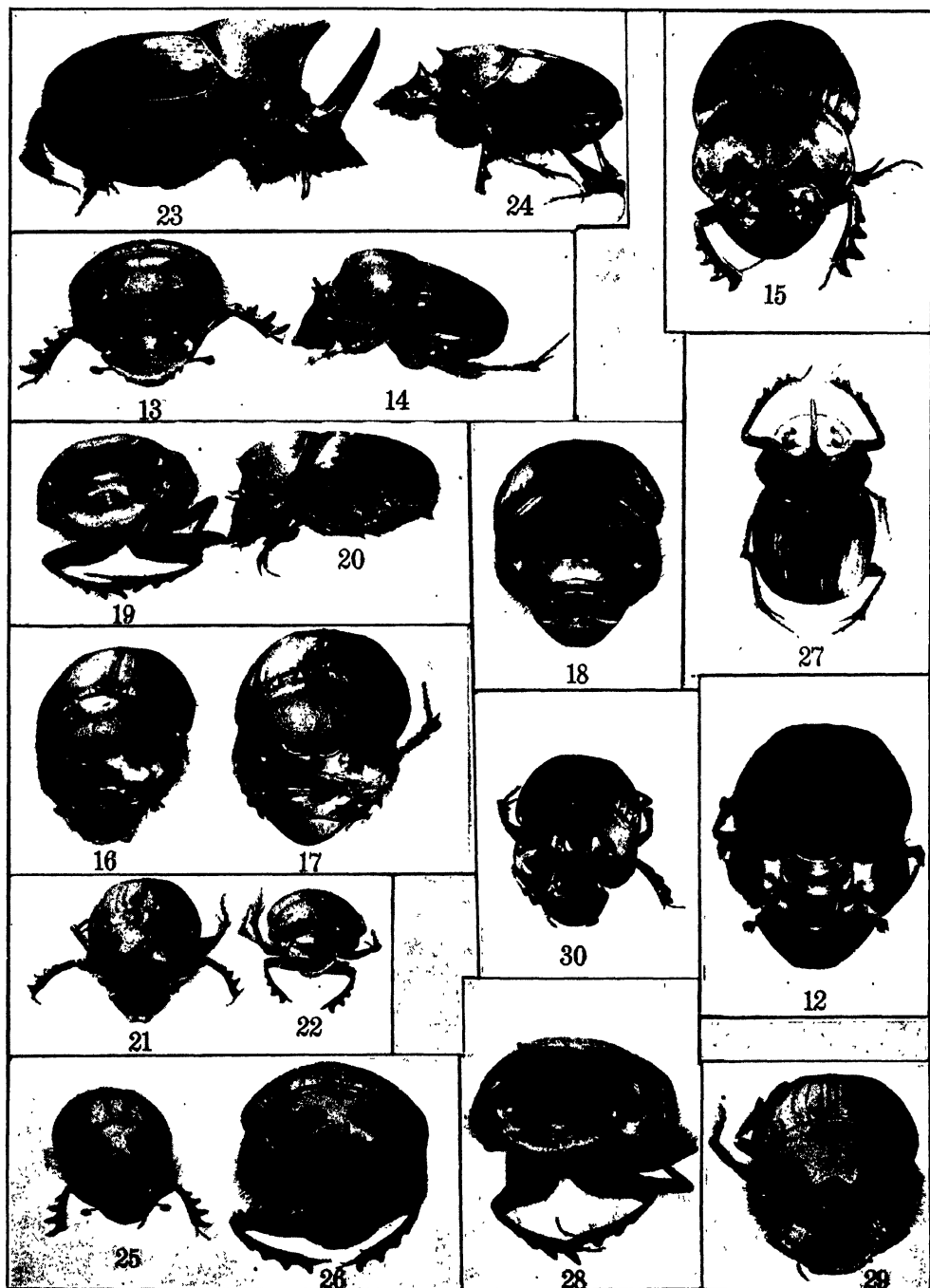
- Figs. 61, 62. *Onthophagus furcaticeps* Masters.  
63. *O. lobicollis* Macl.  
64, 65. *O. walteri* Macl.  
66, 67. *O. cuniculus* Macl.  
68, 69. *O. dunningi* Har.  
70. *O. planicollis* Har.  
71. *O. mamillatus* Lea.  
72. *O. anchommatus* Lea.  
73, 74. *O. tricavicollis* Lea.  
75. *O. spissicollis* Lea.  
76. *O. varianus* Lea.  
77. *O. cribricollis* Lea.  
78. *O. clypealis* Lea.  
79, 80. *O. semimetallicus* Lea.  
81, 82. *O. interruptus* Lea.  
83, 84. *Macropocopris parvus* Blanch.  
85. *M. peramelinus* Lea.

Photographs by N. B. Tindale.



*AUSTRALIAN DUNG BEETLES*

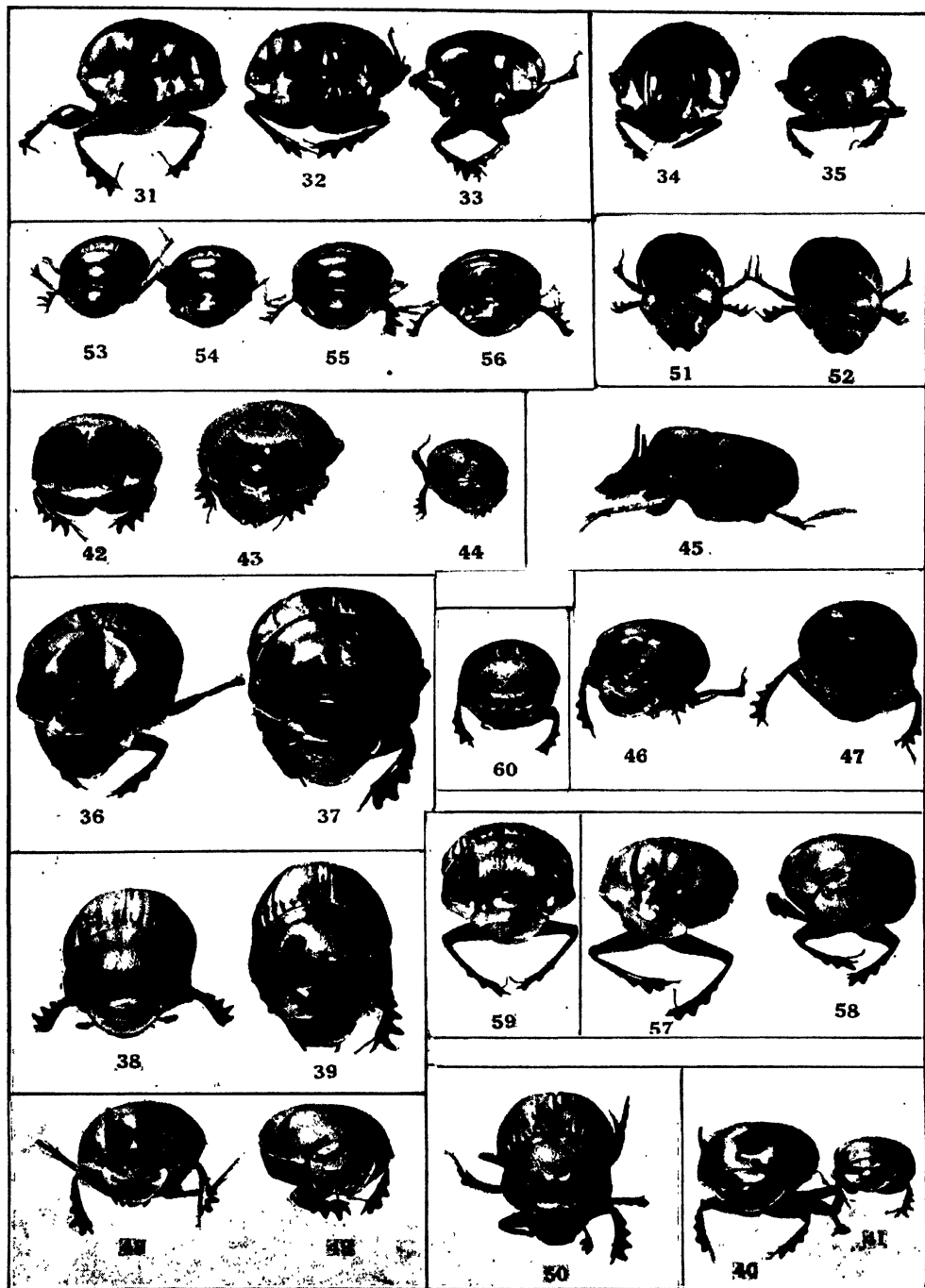




AUSTRALIAN DUNG BEETLES

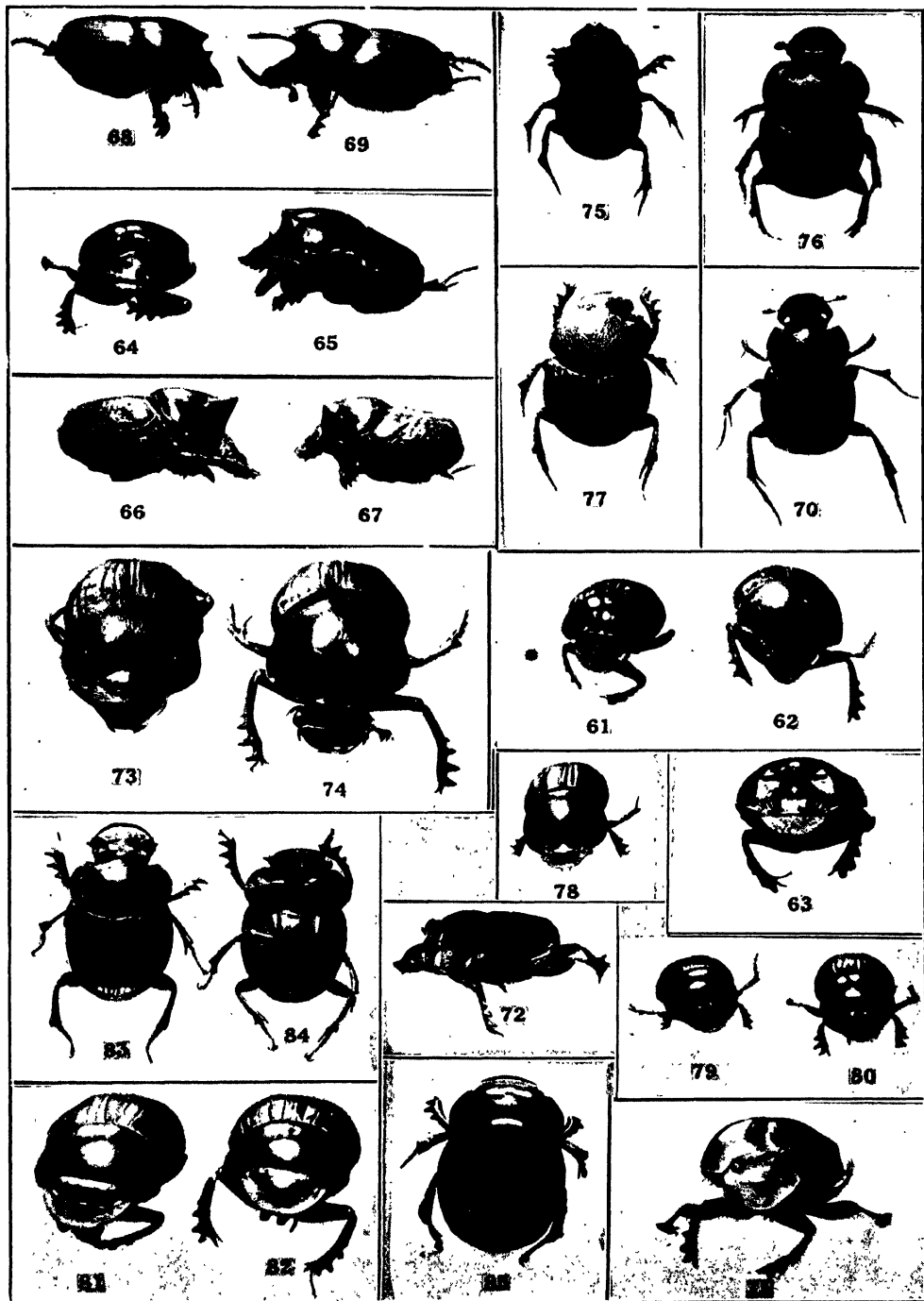






AUSTRALIAN DUNG BEETLES





AUSTRALIAN DUNG BEETLES



# STUDIES IN AUSTRALIAN AQUATIC HEMIPTERA.

No. II.

By HERBERT M. HALE, SOUTH AUSTRALIAN MUSEUM.

## FAMILY NOTONECTIDAE.

Plates x-xi and Text fig. 361-373.

THE salient characteristic of the bugs comprising this family is a curious habit of swimming with the venter uppermost, hence their popular name "back-swimmers." The underside of the abdomen has a median, longitudinal keel, with a trough on each side, over which guard hairs close and imprison the air which is utilized during submergence. The back is very convex longitudinally, so that the thorax is relatively deeper than in other aquatic forms. All the tarsi terminate in two claws and are usually two-jointed; in the male of *Anisops* the anterior tarsi have but one joint, and in the *Plea* herein described, both the anterior and intermediate tarsi are monomerous.

Four genera are recorded from Australia, but of these *Anisops* occurs far more commonly than the others, which are represented each by one species only.

**Specific Characters.** The general size of the head and the comparative width of the dorsal interocular space furnish useful and readily recognized characters in the determination of our species; in this connection the terminology given by Kirkaldy in his "Revision of the Notonectidae, No. 1" <sup>(1)</sup> is here adopted. The whole of the dorsal interocular surface is called by this author the "notocephalon," the term "vertex" is restricted in its usage to define the apparent anterior margin of the notocephalon, while the distance between the posterior angles of the eyes is aptly termed the "synthlipsis"; Kirkaldy later applied this word to a genus of Australian Mirid bugs. As a rule the inner margins of the large eyes diverge more or less from the base of the head and converge slightly towards the front of the notocephalon, so that the vertex is not actually the widest interocular space.

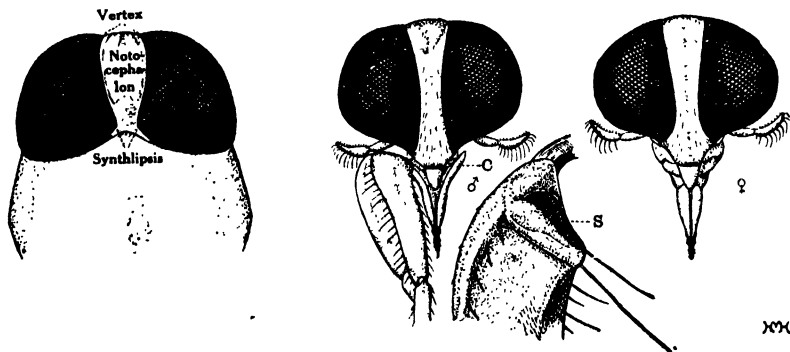
Colour is in most cases a character of little assistance; the notocephalon is ochraceous or testaceous in dried specimens, and the legs are generally of like colour, with parts of the inner or lower surfaces more or less dark brown to black. The species herein dealt with are structurally sufficiently distinct one from the other to be recognized with comparative ease.

**Habits.** All are eminently predatory, and our *Enithares* and *Anisops* are

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(1) Kirkaldy, Trans. Ent. Soc., 1897, p. 393.

readily maintained in aquaria upon a diet of mosquito larvae. *Anisops* impartially inhabits running or stagnant water, clear or muddy. Examples taken from the River Murray lagoons, and others from Broken Hill, New South Wales, are at times infested with an Hydrachnid parasite, which also occurs on Corixids and water-beetles. Seldom more than one parasite is present on a small bug, whereas several are commonly attached to one beetle; the mite is usually fastened to the pronotum of the bugs, more rarely to an eye.



• Fig. 361. Nomenclature of dorsal surface of head.

Fig. 362. Head of *Anisops hyperion* as seen from below; (c) chitinous prongs of beak; (s) femoral stridulatory comb.

With a view to determining in some measure the periods at which the various aquatic bugs occur at Adelaide, the ponds bordering the River Torrens were under observation during two successive years. In these situations the backswimmers disappeared at the end of the autumn, but Corixids were taken throughout the year, hibernating females being found amongst masses of *Nitella* and *Chara* in the cold months. On the other hand, in mid-winter many *Anisops*, including four species, were collected at Broken Hill from dams which had been almost or quite dry during the latter part of the summer.

The life history and biology of *Anisops* have not hitherto been recorded: an account of *Anisops hyperion* is given on page 405.

Excepting for the deposition of eggs, *Anisops* very rarely clings to plant stems, its poise in the water being almost perfect; *Enithares* commonly anchors itself to submerged objects (see pl. x, fig. 1), even walking up a plant stem to the surface for a renewal of its air supply.

**Reproduction.** From an examination of the gonapophyses of the females of six Australian species of *Anisops* it is evident that at least these members of the genus insert their eggs in plant tissues. The endophytic oviposition of *A. hyperion* was proved by actual experiment, and a comparison of the drilling gonapophyses of this species with the others figured on pl. xi will show that, without doubt, all serve a similar purpose.

The ovipositor is very similar in these six species and is of the same character in *Buenoa margaritacea*, the life history and biology of which have been dealt with by Prof. Hungerford. (2) This author also figures the drilling gonapophyses of several *Notonectae*, and while these show specific differences it is probable that throughout *Anisops* and *Buenoa* the ovipositor is of common form.

The ova of Notonectids are elongate, and if merely glued to plants are attached by the long axis; the eggs of Corixids are not elongate, are often peg-top shaped, and either pedicellate (as in *Arctocorisa mercenaria* and *Porocorixa curynome*) or attached at the base to a gelatinous pad (pl. x, fig. 4, 5).

In *Anisops*, considerable dimorphism is exhibited between the sexes. The single-jointed anterior tarsi of the male terminate in curved, flattened and rather blunt claws, and the anterior tibiae are expanded basally on the inner surface to form a spur, on which is situated a stridulatory comb (fig. 362,s). The female differs from the male in having the anterior tarsi two-jointed, with sharper and more slender claws, while the form is usually more robust, the eyes slightly smaller, the notocephalon wider, and the pronotum a little shorter.

In the allied American genus, *Buenoa*, the male has a tibial spur quite similar to that of *Anisops*, and, in some species at least, a femoral area, on which the comb apparently operates. Hungerford describes and figures this apparatus, and mentions that, in addition, there are stridular areas on the face at the base of the beak. In the males of the Australian species of *Anisops* the femoral area is not apparent, but the rostrum is produced on each side to form a chitinous prong; when the anterior legs are folded, the position in which stridulation is effected, the apex of each prong is in juxtaposition with the tibial comb (fig. 362), so that it would seem that sound is produced by the rubbing of the combs on these rostral prongs; the beak is less markedly pronged in the male of *Buenoa*.

The genera at present known from Australia may be distinguished as follows:

- |   |                                 |
|---|---------------------------------|
| a. Abdomen with a median, ventral carina; hemelytra overlapping posteriorly; legs dissimilar; eyes large . . . . .        | Sub-family Notonectinae.        |
| b. Anterior tarsi of male single-jointed . . . . .  | <i>Anisops</i> .                |
| bb. Anterior tarsi of male two-jointed.   |                                 |
| c. Pronotum short, with the anterior angles excavate . . . . .  | <i>Enithares</i> .              |
| cc. Pronotum moderately long, the anterior angles not excavate . . . . .  | <i>Notonecta</i> .              |
| aa. Abdomen without median, ventral carina; elytra not overlapping posteriorly; legs similar; eyes rather small . . . . . | Sub-family Pleinae. <i>Plea</i> |

(2) Hungerford, Bull. Univ. Kansas, xxi, 1919.



## SUB-FAMILY NOTONECTINAE.

**ANISOPS Spinola.**

*Anisops* Spin., Ess. Hem., 1837, p. 58; Fieb., Rhynchotogr., 1851, p. 57; Stal., Hem. Afr., iii, 1865, p. 191; Kirk., Wien. ent. Zeit., xxiii, 1904, p. 111.

Type, *A. niveus* Fabricius.

This is the predominant Notonectid genus in Australia. The form is slender and the last antennal segment is longer than the penultimate segment, a condition reversed in *Notonecta*. When in the water the bugs appear silvery, with the venter dark.

KEY TO AUSTRALIAN SPECIES OF *ANISOPS*.

- a. Head large, as wide, or almost as wide, as pronotum.
  - b. Form slender; eyes of male almost touching at base of head.
    - c. Male with a cephalic horn . . . . . *fieberi*.
    - cc. Male without cephalic horn . . . . . *doris*.
  - bb. Form robust; eyes well separated at base of head.
    - d. Synthlipsis narrower than vertex.
      - e. Pronotum of male long, a little wider than its length . . . . . *hyperion*.
      - ee. Pronotum short, twice as wide as long . . . . . *ocularis*.
      - dd. Synthlipsis about same width as vertex . . . . . *endymion*.
- aa. Head small, distinctly narrower than pronotum.
  - f. Synthlipsis less than half vertex . . . . . *gratus*.
  - ff. Synthlipsis more than half vertex.
    - g. Posterior margin of pronotum concavely incised; over 10 mm. in length . . . . . *stali*.
    - gg. Posterior margin of pronotum convex; less than 10 mm. in length . . . . . *calcaratus*.

I know *A. endymion* only from the original description; Kirkaldy does not mention the comparative width of the head, so that its position in the above key is tentative. If it possesses a small head it should be placed with *A. stali* and *A. calcaratus*, from both of which it differs in the wider synthlipsis.

**ANISOPS FIEBERI Kirkaldy.**

*Anisops fieberi* Kirk., Entomologist, 1901, p. 5 & Wien. ent. Zeit., xxiii, 1904, p. 116.

*Anisops niveus* Fieb., Rhynchotogr., 1851, p. 60 (not Fabr.).

♂ Head, including eyes, about as wide as the pronotum; notoccephalon produced outwards and downwards in front of eyes, the anterior margin truncate and slightly concave; interocular space with a narrow swelling on each side, not reaching to base of head and uniting towards front of cephalic projection; synthlipsis about 6 times in the distance between the anterior angles of the eyes; vertex 2 times in an eye. Pronotum 1.7 times wider than long, with a shallow, median depression outlined with some rather indistinct punctures; posterior margin concavely incised; lateral margins almost straight, slightly oblique. Scutellum large, as long as the pronotum, a little longer than wide. Anterior tibiae about 1.8 times as long as tarsi, which are nearly 2.5 times as long as the longest claw. Length, 7 mm.; breadth, 1.7 mm.

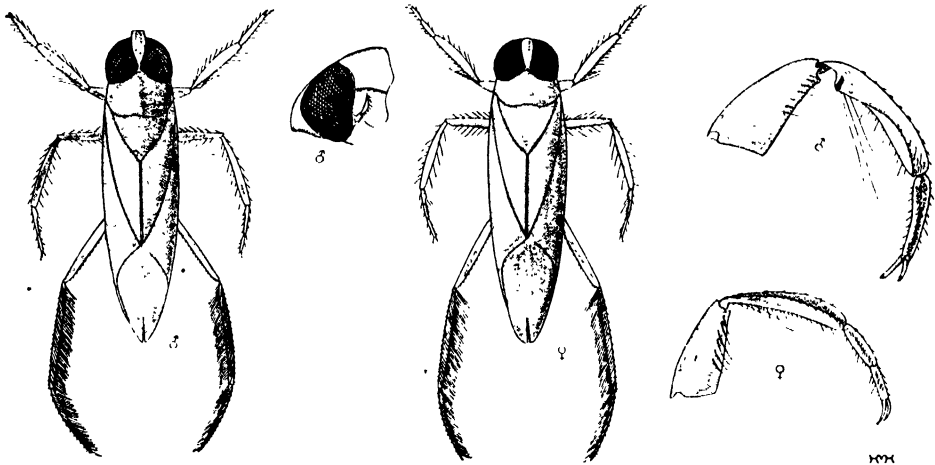


Fig. 363. *Anisops fieberi*.

♀ Vertex not produced in front of eyes; synthlipsis 2.5 to 3 times in vertex, which is 2.3 to 3 times in the width of an eye. Pronotum slightly shorter than in male. Anterior tibiae 1.5 times longer than tarsi, the second segment of which is half as long again as second. Length, 6.5 mm. to 7.2 mm.; width, 1.6 mm. to 1.8 mm.

*Hab.* • Northern Territory: Darwin (G. F. Hill and W. K. Hunt). "Distributed over British India; Celebes" (Kirkaldy); "Ceylon" (Distant).

The colour of the specimens above described has faded to a dingy ochraceous, leaving underside of abdomen, eyes, and swimming hairs black.

**ANISOPS DORIS Kirkaldy.**

*Anisops doris* Kirk., Wien. ent. Zeit., xxiii, 1904, p. 112.

♂ Head, including eyes, nearly as wide, or slightly wider than, the pronotum; notocephalon white to yellow or testaceous, with a median groove, on

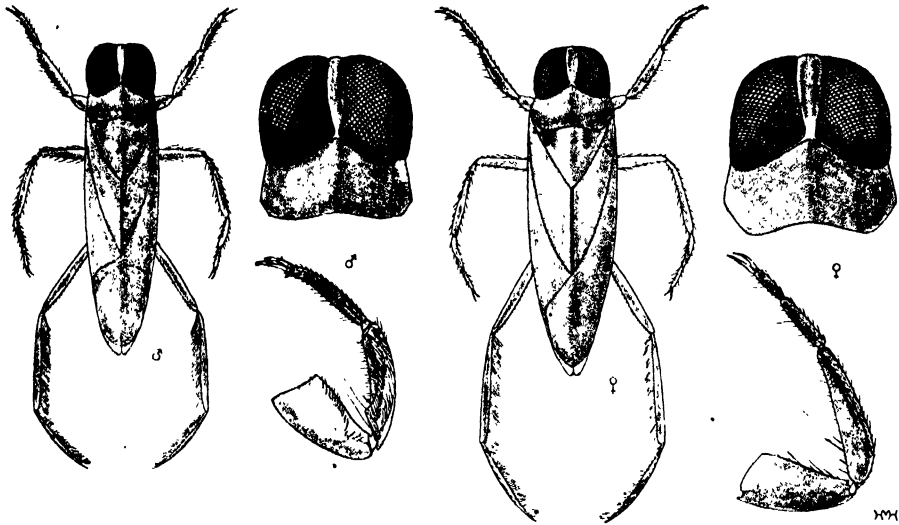


Fig. 364. *Anisops doris*.

each side of which is a narrow swelling, not reaching to base of head; vertex 2.3 to 3.5 in an eye, 3 to 6 times as wide as the narrow synthlipsis; eyes large and prominent, almost touching at base of head. Pronotum pale, smoky or yellow, sometimes darkened posteriorly; about twice as wide as long; superficially punctured; sides parallel or not very divergent. Scutellum pale yellow, bright orange or scarlet, usually with a more or less diffused, large, triangular, black spot on each side; about as wide as long, 1.5 times the length of the pronotum. Metanotum and upper side of abdomen yellowish, black, or testaceous marked with black. Underside black, with carina and lateral edges testaceous. Anterior tibiae 1.4 times the tarsi, which are 2 to 3 times as long as the longest claw. Length, 4.5 mm. to 8 mm.; width, 1.1 mm. to 2 mm. ("8½ mm.-9 mm." Kirk.).

♀ Form more robust, eyes not so large and always distinctly separated at base of head, and pronotum slightly wider, with the sides more divergent, than in male. Vertex twice, or more than twice, as wide as synthlipsis, which is 5 to 6 times in an eye. Length of second joint of anterior tarsus more than 1.5 times that of first. Length, 5 mm. to 9 mm.; width, 1.28 mm. to 2.2 mm. ("8 mm.-9¼ mm.," Kirk.).

*Hab.* South Australia: Adelaide, Murray Bridge, Port Willunga, and Northern Flinders Ranges, 2,000 ft. (H. M. Hale), Lucindale (B. A. Feuerheerdt), Mount Lofty Ranges (J. Formby, J. G. O. Tepper, and H. M. Hale), River Light (Molineaux), Myponga Swamps (A. H. Elston and H. M. Hale), Kangaroo Is. (B. B. Beek); Northern Territory: Alexandria (type locality); Queensland: Gladstone (A. M. Lea), Dalby (Mrs. F. H. Hobler), Karroongooloo Station (H. S. Allnutt); New South Wales: Sydney (W. B. Gurney), Mittagong and Tamworth (A. M. Lea), Broken Hill (F. W. Shepherd); Victoria: Melbourne (Searle), Coromby (J. G. O. Tepper); Tasmania (A. Simson).

The slender form, large eyes and narrow notocephalon are the salient features of this species. The synthlipsis of the male varies in width, but is always exceedingly narrow; the eyes are never actually contiguous basally, although in one instance they are separated by no more than the diameter of an eye facet; the vertex also varies in both sexes. The intermediate tibiae of the several specimens measured by me are relatively shorter than stated by Kirkaldy. A point worthy of note is the variability of size as compared with other Australian members of the genus with similar distribution; large and small specimens have been taken in company in the same localities. During trips to the northern districts of South Australia in 1920 and 1921 a few examples flew to camp lights at night, and others were collected in the clear brackish creeks.

In the spring of 1922 many thousands of backswimmers were congregated near the edges of a small dam in the Mount Lofty Ranges; two species were present in all stages, from egg to adult, most of the imagoes having recently completed their metamorphoses. A census showed that *A. doris* occurred along one side of the pool, while *A. hyperion* was confined to the opposite margin.

### **ANISOPS HYPERION Kirkaldy.**

*Anisops hyperion* Kirk., Wien. ent. Zeit., xvii, 1898, p. 141 & xxiii, 1904, p. 113 (part?).

♂ Head, including eyes, almost as wide as the pronotum; notocephalon ochraceous or testaceous, sometimes suffused at base with orange; with a median longitudinal groove, on each side of which is a swelling, which does not reach to base of head; vertex 1.4 to 1.9 times the synthlipsis, which is 3 to 4.5 times in the width of an eye; tumidities of notocephalon converging on clypeus to form a median carina, on each side of which, and bordering the eye, is a line of punctures. Pronotum pale anteriorly, usually blackish on posterior half, sometimes wholly black or wholly white; length a little less than four-fifths the humeral width; with shallow, scattered punctures and an indistinct, coarse median carina, which does not extend to the posterior margin; hinder edge concavely incised.

Scutellum anteriorly black, or with one or two black spots on each side; disc scarlet, orange or black, sides margined with yellow; wider than long, one-half to three-fourths the length of the pronotum. Metanotum and upper surface of abdomen (visible through wings) ranging from yellowish, varyingly marked with black, to black. Underside mostly black, with ventral carina and edges of segments pale testaceous. Legs ochraceous or testaceous; swimming hairs golden brown to black; anterior femora broad, on inner surface concave, the greatest width equal to half the length; anterior tibiae about one-third longer than tarsi, which are four times as long as the longer claw; intermediate femora one-fourth longer than the tibiae, which are more than one-third longer than tarsi; first segment of tarsus three-fourths longer than the other. Length, 7 mm. to 8 mm.; width, 2 mm. or a little more.

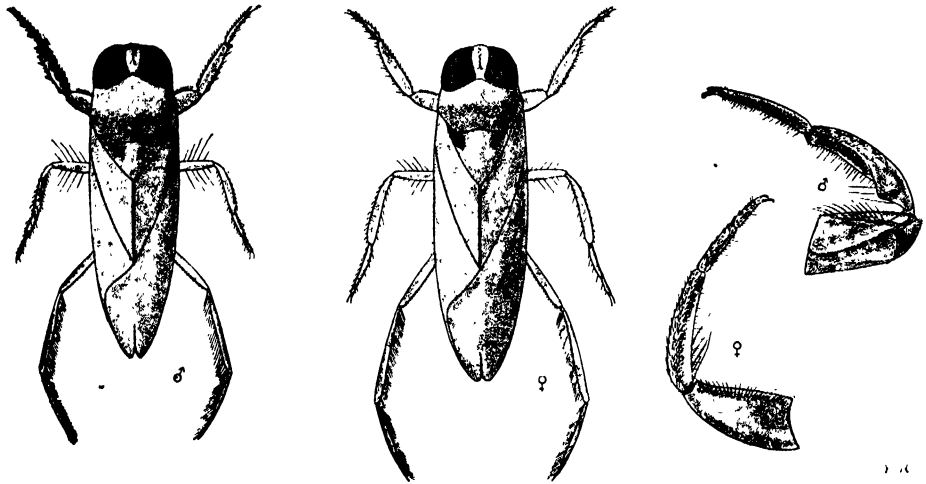


Fig. 365. *Anisops hyperion*.

♀ Pronotum a little wider than in male; vertex 1.5 to twice wider than synthlipsis, which is about three times in the width of an eye (less than four times in the type). Pronotum much shorter than in male, the length barely two-thirds the humeral width. Scutellum three-fourths of length, to about as long as the pronotum. Anterior femora not expanded, the greatest width (at base) being less than half the length; anterior tibiae about two-fifths longer than tarsi, the first segment of which is almost twice as long as the second. Intermediate tibiae less than one-fourth longer than tarsi. Length, 7 mm. to 8.6 mm.; width, 2 mm. to 2.5 mm.

*Hab.* South Australia: Adelaide, Mount Lofty Ranges, Port Willunga. Murray River and Northern Flinders Ranges, 2,000 ft. (H. M. Hale), Myponga

Swamps (A. H. Elston and H. M. Hale), Lucindale (B. A. Feuerheerdt), Beachport, South-Eastern districts (S. S. Stokes), Bordertown (J. G. O. Tepper), Baldina Creek (A. Zietz), Mount Parry (Tate); Queensland: Longreach (A. M. Lea), Rockhampton (type locality); New South Wales: Broken Hill (F. W. Shepherd); Victoria: (*vide* Kirkaldy); Western Australia: Mullewa (Miss J. F. May).

The specimens from Broken Hill are largely jet black, with the scarlet of the scutellum prominent.

This species superficially resembles *A. stali*, but may be easily recognized by the smaller size, larger head, and by the very different anterior legs. *A. hyperion* was originally described from female examples taken in Queensland; the proportions of the intermediate legs of the above specimens differ a little from those of the type, the tibiae being more than one-sixth longer than the tarsi. In the female the uncovered portion of the scutellum is rarely more than the length of the pronotum.

In his "Über Notonectiden" (1904), Kirkaldy gives a short description of both sexes, and adds the following localities: Victoria (Kirk's collection); New Caledonia and Marianne Islds. (Paris Mus.); Viti Islds.: Ovalau.

He then expresses doubt as to whether he has not confused two species; the males described by him are 6 mm. to 7 mm. in length, with the anterior claws longer than in the males of the Australian species herein determined as *A. hyperion*; the examples recorded under this name from New Caledonia, etc., by Kirkaldy, and later by Distant<sup>(3)</sup> may prove to represent another species.

### BIOLOGY AND LIFE HISTORY OF *ANISOPS HYPERION*.

*A. hyperion* is the commonest representative of the genus in South Australia, occurring in both running and stagnant water. As with other species of the genus, its poise in the water is almost perfect; after ascending to the surface, where the tip of the venter is exposed for a second or so, the bug darts down a few inches; slowly, however, it commences to rise, but a stroke of the swimming legs counteracts this buoyancy; gradually the tendency to automatically ascend becomes less marked, and finally the insect commences to slowly sink, so that a reverse movement is necessary to regain equilibrium until the surface is again visited. The bug, therefore, is never actually motionless in the water, but is continually jerking up and down, or down and up.

**Food.** The food consists of aquatic animals small enough to be mastered; for more than eight months examples confined in battery jars were maintained

(3) Dist., Nova Caledonia, Zool., i, 1914, p. 386.

upon mosquito larvae and pupae, both of which are captured with ease: indeed, the adults and, to a lesser degree, the fifth instar nymphs, appear to favour the pupae, for if such are present they are taken before the larvae. The victims are securely held beneath the comb-like bristles arming the margins of the anterior and intermediate legs, and are dexterously turned about as the beak is applied to fresh portions. The rapacity of the bugs is remarkable; unless unduly disturbed, examples which have captured a "wiggler" do not relinquish their prey when lifted out of the water during transit to another vessel.

Throughout the life cycle the nymphs also fed upon this diet; egg rafts of *Culex* were placed in the jars containing the hatching bugs, and the tiny emerging larvae were easily captured by the precocious nymphs. Between the second and final moults (a period of less than four weeks) isolated examples on an average each accounted for about 200 medium sized larvae, while during the first two stages many hundreds of newly-hatched larvae were eaten. A laying female during one month caught 33 large larvae and 37 pupae of *Scutomyia notoscripta*.

**Breeding Habits.** There are at least two generations every year, eggs being deposited as late in the season as April, the progeny wintering as adults and breeding the following summer. Copulation has been noted at the beginning of August.

With the object of recording the breeding and other habits of the species, examples hatched during the summer were installed in balanced aquaria towards the end of the season (April). Throughout the winter these bugs remained active and feeding. In early spring mating took place, and the first batch of larvae hatched on October 27th.

The courtship is most fascinating: the male, stridulating rapidly the while, poises below and a little behind the female, and in this position accompanies her every movement; finally, with the extended posterior legs quivering with excitement, he attempts to clasp her from below. He is not, however, in any way faithful to one consort, for if another female passes near, and the first has not responded, position is taken below the newcomer; if she proves more amenable a union is effected and the couple remain *in copula* for an hour or more; the male occupies a position below and slightly to the right side of the female (that is to the left, as the bugs are viewed upside down), the curious, finger-like anterior tarsal claws enabling him to maintain his embrace.

A description of the stridulatory apparatus of the male of *Anisops* is given in the introduction to this paper. When *A. hyperion* is stridulating the anterior legs are flexed still more than usual, the tarsi almost touching the body; the base of the tibia moves up and down over the rostral prong with extraordinary rapidity, and sometimes a tiny, silvery bubble may be seen at the point of

friction; the sound is often maintained for long periods; in mid-winter one example continued its song intermittently during the whole of one day, as is the case during breeding. Stridulation commences with a rapid series of squeaky notes, not loud, but continued for a minute or more; the notes then become slightly louder and more metallic, and finally merge into a shrill and loud chirrup, which is not sustained, the song soon sinking to *pianissimo* or ceasing altogether. When sitting near an aquarium containing stridulating *Anisops*, the effect is as of a distant grindstone at work, with the sound borne very faintly to the ear. Sometimes the characteristic chirrup is produced without the preliminary fainter notes, and *vice versa*, but in any case the stridulation is quite easily distinguished from the fewer and less quickly repeated notes of Corixids.

**Oviposition.** It has been mentioned that an examination of the female genitalia of the Australian species shows that all insert their eggs in plants. Some thick stems of *Potamogeton tricarinatus*, an indigenous water-plant, were anchored close to the glass of an aquarium containing some of the bugs under observation, and it was thus possible to watch the whole process of oviposition. The female grasps a stem with the anterior and middle legs and curves the abdomen so that its tip is almost touching the surface of the plant; the orifice opens and the point of the ventral carina explores the stem, the insect meanwhile walking down the support until a suitable site is selected. The genitalia are then extruded, the point of the abdominal keel is firmly applied and kept rigid, and quite close to it the drilling gonapophyses work at the stem with a circular, scraping motion; the epidermis is soon penetrated and an oval cavity is gouged out of the plant tissue. As the hole increases in size the tip of the carina slips into it at the lower edge (the insect being head-downwards), while all the time the drilling organs can be seen inside the semi-transparent stem, operating with a characteristic gouging movement.

When the hole is completed there is a short pause; then an egg is inserted, leaving a small portion of the anterior surface exposed at the mouth of the cavity. Finally the sensitive lip of the pygidium moves over and about the exposed portion of the egg, as if to make sure that all is well; the silky hairs of the posterior abdominal segments and ovipositor are doubtless to some extent tactile. The actual drilling of the *Potamogeton* tissue occupied from 35 to 50 seconds, the insertion of the ovum about 15 seconds. After an egg is laid the female swims away, vigorously cleaning the tip of the abdomen with the posterior legs and constantly exposing the genitalia while doing so. Oftentimes the female settles on a stem, explores the surface with the closed tip of the abdomen, and floats off again, as if dissatisfied with the location; if the ovipositor is extruded, however, one can be sure that, if not disturbed, the female will insert an egg



before leaving the stem. The bugs are shy during copulation and oviposition, and are rather easily disturbed in either act.

**Period of Oviposition.** In a jar containing one male and three females, the latter were simultaneously depositing eggs on November 1st; each laid only a few eggs a day, oviposition being most active after mid-day, when the sun was shining into the laboratory; at this time of day the male seemed greatly excited, frequently stridulating, poising beneath the females, and attempting to clasp them from below. On November 20th one of them, which had completed oviposition, was floating venter uppermost at the surface, apparently unable to maintain its poise, and shortly died; on this date the male was again *in copula* with one of the remaining females, both of which continued laying until about November 22nd, on which date the first of these nymphs hatched. The second female died on the 24th, and all weed was now removed from the vessel, so that the surviving female, which had not completed egg-laying, had perforce to cease ovipositing. The male perished on the 29th, but the female remained quite healthy for the following three weeks; at the expiration of this time a fragment of *Potamogeton* was dropped into the jar, and the interrupted oviposition was immediately continued, two eggs being laid in rapid succession. The survivor lived until the middle of January, 1923.

**The Nidus.** A plant stem or leaf of sufficient thickness to accommodate the eggs, and which the ovipositor is capable of drilling, is utilized if such be present; when indigenous *Potamogeton* and *Myriophyllum* are growing in localities favoured by *Anisops* the stems of these plants are usually found to contain eggs.

As an experiment a gravid female was isolated in a jar containing only small plants of *Vallisneria spiralis*, the thin leaves of which are ill suited for the reception of the ova. A great number of slits in the leaves indicated abortive attempts to prepare suitable receptacles, and the eggs deposited in this nidus were but partially concealed, so that it was possible to photograph them *in situ* (pl. x, fig. 3-4).

**Period of Development.** About a fortnight after deposition the eggs exhibited the first traces of the red eye pigment of the enclosed embryo, and in another week the nymphs emerged. This period for incubation obtained with the water at a mean temperature of 67° F., but the time varies according to the temperature of the water and the season of the year; eggs deposited in December developed more rapidly, the eye-pigment appearing in a few days. The skin is moulted five times during the metamorphosis, the first four instars each occupying about a week, the fifth a little longer. In aquaria the individual variation in the periods between moults was as follows:—First, 7 days; second, 7-8 days;

third, 6-8 days; fourth, 7-10 days, and the fifth about 10 days. Thus the nymph attains maturity about two months after the egg is laid.

**Habits of the Nymphs.** The newly-hatched nymphs, as in the case of larvae of other Notonectid genera observed by Hungerford, are singularly helpless until the guard hairs have become charged with air; after tumbling about in awkward efforts to attain the surface film, they sink to the bottom exhausted. Several examples in this condition were placed in a small dish containing water to the depth of half an inch, and after three days none had filled its guard hairs; possibly during this period respiration was effected through the skin by osmotic action. They were then placed in a "balanced" aquarium containing ample weed, and next morning, with guard hairs filled, all were poised in the water, active and feeding. These first instar nymphs remain quite near the surface and behave much as do the imagos. In situations where *Anisops* is breeding, they do not mingle with the more developed examples, but congregate in the shallowest water at the margins of the pools, the shoals often comprising many thousands of individuals; adults do not appear to prey upon these swarming nymphs.

The moulting is not the least interesting phase of the metamorphosis: the skin splits along the dorsal median line of the thorax (where it is weakest), but the integument of the abdomen is unruptured; the skin of the head splits at the junctures of the eyes and notocephalon. The legs are drawn out of the previous sheaths, leaving the last-named, complete with swimming hairs, spines, etc., intact; the abandoned skin floats at the surface, a hollow replica of the nymph from which it is practical to compute leg and other measurements. Occasionally a nymph fails to rupture the skin and so dies; in an example which has perished thus the dorsum is characteristically humped owing to the abortive effort to burst the skin. After each moult the bug immediately expands to the proportions of the next instar.

**Developmental Changes.** The first instar nymph has no ventral carina on the abdomen and, even towards the end of the instar, very little pigment on the venter. The claws, as in the adult, are unequal, but are relatively much larger, decreasing regularly in proportion to the size as the bug grows; the posterior claws, for instance, are conspicuous in the first instar nymph, and measure one-fifth of the length of the tarsus, while in the adult they are small, hidden by the swimming hairs, and but one-tenth of the length of the tarsus. The anterior and intermediate tibiae and tarsi are concave on their inner surfaces as in the imago, but all the tarsi are single-jointed until after the final moult. The width of the synthlipsis in relation to that of the vertex does not differ greatly throughout the life history, but the eyes are at first small and the notocephalon is proportionally

much wider than in the imago. As successive instars are attained, the eyes become larger and more rounded.

Below is a description of each stage of the life history, following which is a table giving the average measurements of several specimens of each. The life history is illustrated on pl. xi, fig. 1 to 9.

*The egg.* Surface with small hexagonal reticulations. Colour pearly white when first laid, ochraceous, with red eye spots as development proceeds. Length, 1.32 mm.; widest diameter, .52 mm., rather more as the enclosed bug attains larger proportions.

*First instar nymph.* Head somewhat conically produced in front of the small, widely separated eyes; vertex nearly twice as wide as the synthlipsis, which is one-third of the width of the head. Anterior and intermediate tarsi less than twice as long as the claws. (The longer claw of the pair terminating each tarsus is measured.) Lower edge of the posterior fulchra with a row of fine striae as in the adult. Swimming hairs rather sparse on posterior tarsus, almost absent on the tibiae. The colour is transparent whitish, with the eyes red, the guard hairs black, and the swimming hairs and a streak on the inner margin of the posterior tarsus dark brown. After the bug commences to feed the abdomen is dark owing to contained food, but as the instar draws to a close true pigmentation is slightly developed on the underside of the abdomen. Length, 1.8 to 1.9 mm.

*Second instar nymph.* Head less conically produced in front of the eyes than in previous instar; vertex slightly more than one and a half times the synthlipsis, which is three and a half times in the width of the head. A somewhat poorly developed ventral keel is now present, but the abdominal gutters are hardly apparent; the guard hairs are arranged as in the adult. A space on the venter between these is brown and a faint dark streak appears on the underside of the posterior femora. Posterior femora, tibiae, and tarsi subequal in length. Anterior tarsi more than three times as long as claws, intermediate tarsi three times as long as claws. The swimming hairs on the posterior tarsi are denser, and a sparse fringe appears on the posterior tibiae. Length, 2.3 to 2.5 mm.

*Third instar nymph.* Head evenly rounded in front of eyes. Vertex about one and a half times the synthlipsis, which is one-fourth of the width of the head. The wing pads have appeared and extend past the first third of the thorax. Anterior and intermediate tarsi about three and a half times as long as their claws. Swimming fringes are developed on both margins of the posterior tibiae and tarsi. Limbs and under-surface in parts sooty; head ochraceous. Length, 3.2 and 3.56 mm.

*Fourth instar nymph.* Vertex about one and a half times the synthlipsis, which is 4.4 to 5.27 times in the width of the head. The wing pads extend to

beyond the middle of the length of the thorax. Anterior tarsi nearly four times longer than claws; intermediate tarsi more than four times longer than claws. Abdominal gutters now prominent. Pigment on venter of abdomen dark brown. Length, 4.12 to 4.5 mm.

*Fifth instar nymph.* Head much as in the adult, but notocephalon proportionally a little wider. The wing pads reach slightly beyond the posterior margin of the thorax. Anterior tarsi rather more than four times longer than the claws, intermediate tarsi more than four and a half times longer than claws. The pigment on the abdomen is almost black and the streak on the underside of the posterior femora is prominent; head and prothorax dark ochraceous.

In this instar the sex of each nymph can be determined, the immature males having the eyes more prominent, the notocephalon narrower, and the inner margins of the eyes rather less divergent, than in the other sex. Furthermore, by means of transmitted light, the two-jointed tarsi of developing females can be discerned through the integument of the single-jointed tarsi of nymphs nearing the final moult (pl. xi, fig. 9); similarly, the monomerous anterior tarsi and characteristic anterior tibiae of the male can be seen.

♂ Vertex, 1.34 to 1.8 times as wide as the synthlipsis, which is 4.5 to 6.8 times in the width of the head.

♀ Vertex, 1.35 to 1.5 times as wide as the synthlipsis, which is 3.4 to 4.6 times in the width of the head.

Length, 5.1 to 6.12 mm.

*The imago.* Newly moulted adults have a clear whitish appearance, with the underside of the abdomen brown; the scarlet of the scutellum and the dark colour on pronotum and dorsum of abdomen, etc., are developed later; the integument is at first soft, and the bugs shrivel if dried too soon after the metamorphosis is completed.

♂ Synthlipsis, 6.97 to 9.8 times in width of head.

♀ Synthlipsis, 6.1 to 8.0 times in width of head.

Other proportions are given in the general description of the species.

#### DIMENSIONS OF NYMPHS AND ADULTS.

Instar.	1	2	3	4	5	6 ♂	6 ♀
Total length . . . .	1.85	2.4	3.38	4.31	5.61	7.5	7.8
Greatest width . . . .	.6	.77	1.15	1.38	1.6	2.0	2.25
Width of head . . . .	.55	.7	1.0	1.14	1.48	1.7	1.78
Vertex . . . . .	.33	.32	.37	.4	♂ .417 ♀ .53	.36	.425

Synthlipsis . . . .	·18	·2	·25	·26	♂ ·29	·22	·256
					♀ ·37		
Anterior femur ..	·3	·35	·49	·65	·875	1·1	1·0
„ tibia . . .	·4	·48	·63	·837	1·135	1·37	1·29
„ tarsus ..	·275	·33	·47	·6	·77	1·01	·93
Intermediate femur.	·425	·52	·79	1·1	1·365	1·7	1·72
„ tibia..	·36	·45	·675	·875	1·13	1·33	1·39
„ tarsus.	·275	·34	·50	·625	·8	·97	1·02
Posterior femur ..	·65	·82	1·1	1·385	1·94	2·32	2·35
„ tibia.. .	·68	·81	1·0	1·31	1·57	1·85	1·93
„ tarsus . . .	·8	·83	·95	1·165	1·307	1·34	1·46

### ANISOPS OCULARIS sp. nov.

♂ Head, including the large and prominent eyes, very slightly narrower than the pronotum; notocephalon with a swelling on each side, not reaching to base of head, converging at vertex and continued as a median carina on to the very narrow face; synthlipsis about 1·5 in vertex, 5 times in the width of an eye. Pronotum pale testaceous; as long as the head, twice as wide as long, with a

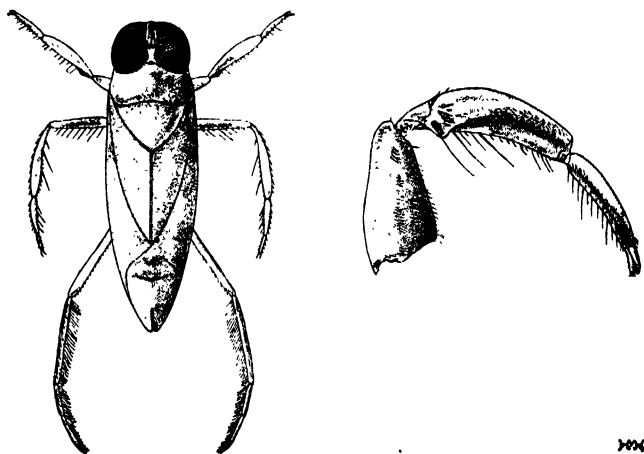


Fig. 366. *Anisops ocularis*.

feeble median carina, which disappears posteriorly; hinder edge slightly concavely incised. Scutellum testaceous, with a large, pale triangular patch near each anterior angle; wider than long, and about 1·25 times as long as the pronotum. Metanotum testaceous; upperside of abdomen pale, with the posterior segments in parts black. Underside of abdomen black, ventral carina and lateral edges ochraceous. Anterior tibiae much expanded, the greatest width (near the

base) being  $\cdot 3$  of the length; anterior tarsi 1.6 times in tibiae, 3 times longer than the longer claw. Length, 8 mm.; width, 2.5 mm.

*Hab.* Northern Territory: Darwin (W. K. Hunt).

The type is the only representative of this species before me. As in *A. doris*, the eyes are large, the notocephalon is narrow, and the pronotum is short; it differs, however, in the wider synthlipsis, the markedly more robust form, the much more expanded anterior tibiae of the male, etc. It resembles Distant's description and figure of *A. cleopatra* from New Caledonia, but in that species the synthlipsis is "not more than half" as wide as the vertex and the size is smaller.

### **ANISOPS GRATUS sp. nov.**

♂ Head, including eyes, narrower than the pronotum; notocephalon with a median groove, on each side of which is a slight swelling; synthlipsis little more than 2 times in vertex, 5 times in the width of an eye. Pronotum almost one and a half times wider than long, with scattered punctures and a median fovea; posterior margin concavely incised, lateral margins divergent. Scutellum yellow, shorter than the pronotum; wider than long. Legs slender; anterior thigh 1.3 times tarsus; longer claw 2.5 in tarsus. Length, 7 mm. to 8.5 mm.; width, 2 mm. or slightly more.

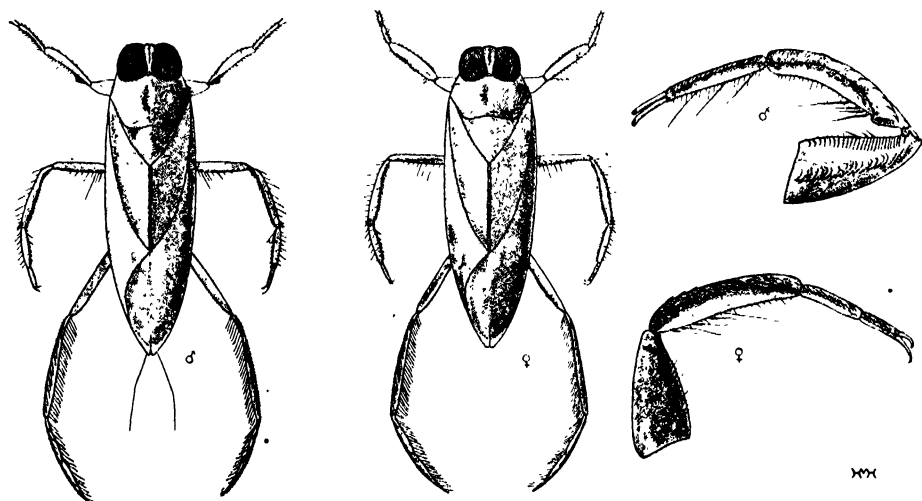


Fig. 367. *Anisops gratus*.

♀ Synthlipsis 2.5 to 3 in vertex, 4 to 5 times in the width of an eye. Pronotum a little shorter than in male. Scutellum about same length as pronotum, as wide as long. First joint of anterior tarsus almost twice as long as second; claws shorter than in male. Length, 7 mm. to 9 mm.; width, 2 mm. to 2.5 mm.

*Hab.* South Australia: Murray River (H. S. Cope), Adelaide and Port Willunga (H. M. Hale), Lucindale (B. A. Feuerheerdt), Bordertown (J. G. O. Tepper), Summertown (Pullman); Central Australia: Lake Callabonna (A. Zietz); Queensland: Karoongooloo Station (H. S. Allnutt); New South Wales: Broken Hill (F. W. Shepherd, type locality); Western Australia: Mullewa (Miss J. F. May).

In this species the synthlipsis is narrower than in *A. hyperion*, *stali*, or *endymion*; a more robust form and smaller head at once separate it from *A. doris* and *fieberi*. The eyes of the male are occasionally much closer at the base of the head than in the type; in one example the synthlipsis is 4 times in the vertex and 10 times in the width of an eye. Although the synthlipsis varies thus, the vertex remains approximately the same, about 2.5 times in the width of an eye.

The delicate colours of *A. gratus* soon fade after death; the colouration of fresh samples collected by Mr. F. W. Shepherd in New South Wales, and by myself in South Australia, is as follows: Notocephalon very pale yellow, almost white. Pronotum orange, paler anteriorly. Scutellum clear lemon yellow, posteriorly suffused with orange. Metanotum and anterior part of upper side of abdomen (as seen through wings) clear lemon yellow, posteriorly delicately shaded with orange; sides of abdomen pale pink, the edges of segments shaded with brown; sternum yellow, underside of abdomen black, in parts yellow. Legs pale, coxae, femora, and tibiae marked with brownish-black on inner surfaces.

### **ANISOPS STALI Kirkaldy.**

*Notonecta australis* Stal, Ofr. K.V.Ak. Forh., xii, 1855, p. 190 (nec. Oliv.).

*Anisops australis* Stal, Eugenie Resa, 1859, p. 267.

*Anisops stali* Kirk., Wien. ent. Zeit., xxiii, 1904, p. 113.

♂ Head, including eyes, much narrower than the pronotum; notocephalon ochraceous, produced downwards and slightly outwards in front of eyes, the anterior margin being truncate and a little concave, with a small projection at each angle; anterior three-fourths with a median, punctured groove, on each side of which is a swelling with an impressed line of punctures defining its outer margin; these tumidities converge anteriorly and meet in the middle of the front edge of the notocephalic projection; synthlipsis 1.3 to 1.5 times in the distance between the anterior angles of the eyes, and 2.3 to 2.5 in the width of an eye; face seen in profile, concave, so that the lower part of the eye projects in front of it on each side. Pronotum white, posteriorly black or reddish, about 1.5 times wider than long, with some indefinite punctures and an indistinct, coarse median carina, which vanishes posteriorly; hinder margin concavely incised lateral margins moderately oblique. Scutellum yellow or orange, anteriorly mor

or less infuscated with red and sometimes with a small triangular black spot near each anterior angle; about as long as the pronotum. Metanotum and upper side of abdomen testaceous marked with black, or black. Underside of abdomen black, with ventral carina and edges of segments testaceous. Anterior tibiae 1.6 times longer than tarsi, which are more than twice as long as the claws. Length, 11 mm. to 12 mm.; width, 3.2 mm. to 3.5 mm.

♀ Vertex not produced as in male, projecting only very slightly in front of the eyes; swellings on notocephalon a little larger and converging on face, which, seen in profile, is almost straight; synthipsis 1.3 to 1.5 in vertex, 2.1 to 2.5 in the width of an eye. Pronotum about 1.75 times wider than long. Scutellum longer than pronotum. Anterior tibiae 1.6 times longer than tarsi; first tarsal segment 1.5 times longer than second, which is little longer than a claw. Length, 10.5 mm. to 13 mm.; width, 3 mm. to 3.5 mm.

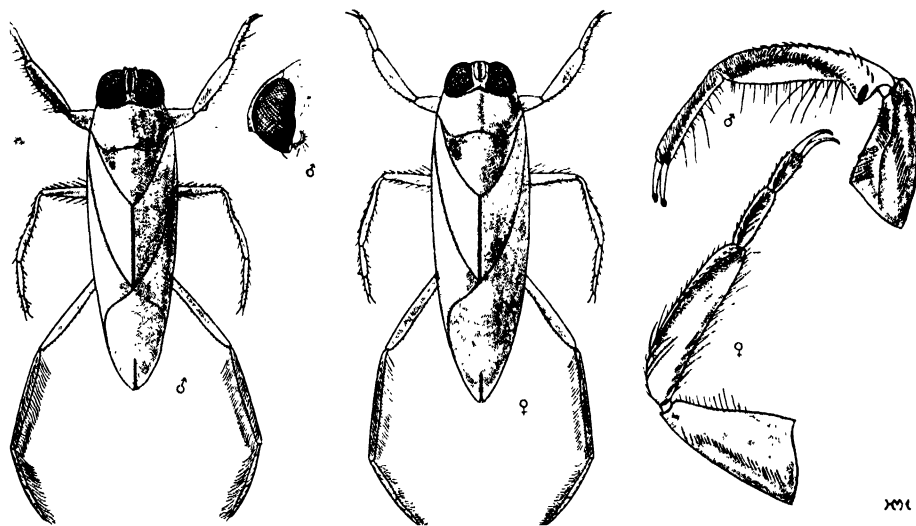


Fig. 368. *Anisops stali*.

*Hab.* South Australia: Murray River (H. M. Hale), "N.W. of South Aust." (Dr. H. Basedow), Bordertown (J. G. O. Tepper), Cordillo Downs (F. Archer; Central Australia: Cooper's Creek (J. G. Reuter), Boorgline Waterhole (Elder Expedition), Andamed Station (A. F. Roberts); Northern Territory: (Capt. S. A. White), Port Darwin; Queensland: Cunnamulla (H. Hardecastle), Karoongooloo Station (H. S. Allnutt); New South Wales: (type locality), Hay (A. M. Lea); Western Australia: Wyndham (S. Stephens).

This is the largest species recorded from Australia. Its form is robust, the body being deep and, seen sideways, considerably arched on the back, so that the



downward inclination of the head is rather more marked than in the other forms; the stout anterior legs are distinctive in their proportions. According to Kirkaldy's measurements, the intermediate tibia of the male is relatively shorter than in the female, but I can find little difference in the examples now examined.

**ANISOPS CALCARATUS** sp. nov.

♂ Head, including eyes, narrower than the pronotum; notocephalon with a median groove, which does not extend to hinder margin of the head and with a swelling on each side; synthlipsis less than 1.5 in vertex, 3.5 times in the width of an eye; notocephalic swellings uniting at the front of the head and continued on to face as a strong, median carina; eyes large, prominent, projecting slightly in front of vertex. Pronotum sordid testaceous, about 1.5 times wider than long, with a coarse, median carina reaching to posterior margin; lateral margins divergent; hinder edge evenly convex. Scutellum testaceous, wider than long, a little longer than the pronotum. Metanotum testaceous, with a black spot on each side; upper side of abdomen testaceous, posterior segments black. Anterior

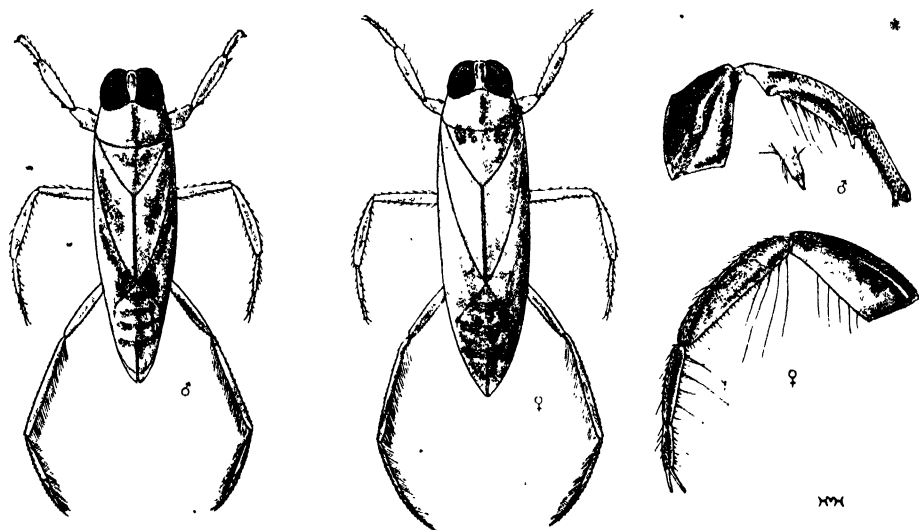


Fig. 369. *Anisops calcaratus*.

femora stout, the superior edge with a knife-like ridge, which gradually rises until it attains a point beyond the middle of the length of the thigh, where it abruptly terminates; summit of this ridge set with very small prostrate spines; tibiae strong, the anterior end of the inner face with a distinct spur, in the apex of which is set a short, stout spine; tarsi damaged. Length, nearly 9 mm.; width, 2.4 mm.

♀ Eyes not so prominent, and notocephalon wider than in male. Synthlipsis 1.5 in vertex, 3 times in the width of an eye. Pronotum about twice as wide as long, with a coarse, median carina; hinder margin convex. Scutellum pale yellow to orange; sometimes with a black spot on each side anteriorly; 1.5 times as long as the pronotum. Anterior femora not ridged on superior edge; anterior tibia one-fourth longer than the tarsi, the first tarsal segment nearly twice as long as the second, which is less than twice the length of the longest claw. Length, 8 mm. to 9.5 mm.; width, 2.5 mm. to 3 mm.

*Hab.* South Australia: Bordertown (J. G. O. Tepper, type locality); Queensland: Cunnamulla (H. Hardeastle).

The type, which is somewhat damaged, is the only male of this distinct species as yet received. The convex posterior margin of the pronotum distinguishes it from all other Australian forms, excepting possibly *A. endymion* Kirk.; in the description of the last-named species the character of the hinder edge of the pronotum is not stated, but the synthlipsis is described as about half the width of an eye and but slightly narrower than the vertex, while the pronotum is relatively longer and the scutellum shorter than in the female of *A. calcaratus*.

### ANISOPS ENDYMION Kirkaldy.

*Anisops endymion* Kirk., Wien. ent. Zeit., xxiii, 1904, p. 114.

“Elytra ash-coloured, transparent. Posterior half of exocorium and the clavus smoke-coloured, anterior half of clavus, basal margin of corium and the basal half of exocorium, black. Veins of wings pale. Metanotum brownish-black, lateral margins pale. Legs pale. Abdomen above dull, pale, in the centre black. Below black. Crown longitudinally grooved, hardly broader on the anterior margin than on the synthlipsis, the breadth of the latter barely half the width of an eye.

Anterior margin of the pronotum between the eyes much more distorted than in other species (the distorted portion rounded anteriorly); pronotum three-fourths broader than its length, longer than the scutellum. Anterior and middle tibiae flat and laterally expanded, broader at end than at base; one-fifth times longer than tarsi, first tarsal segment two-fifths longer than the other, which is two and a half times as long as the claw. Length, 9 mm.; breadth, 3 mm.

*Hab.* Australia: Swan River (Perth Museum, Scotland).

Only a single female of this distinct species is before me.”

I have not seen this species, and as the publication in which it is described is not included in our libraries a translation from the German of the original description is given above. *A. endymion* differs from the other species herein described in the wider notocephalon.

**NOTONECTA Linnaeus.**

*Notonecta* Linn., Syst. Nat., ed. x, 1758, p. 439; Fieb. Rhynchotogr., 1851, p. 48; Flor., Rhynch. Livl., i, 1860, p. 766; Saund., Hem. Heteropt. Brit. Is., 1892, p. 329; Kirk., Trans. Ent. Soc., 1897, p. 397.

Type, *N. glauca* Linnaeus.

Only one Australian species may be definitely assigned to this almost universally distributed genus; no *Notonectar* occurred amongst the considerable amount of material examined for the preparation of this paper.

**NOTONECTA HANDLIRSCHI Kirkaldy.**

*Notonecta handlirschi* Kirk., loc. cit., p. 408.

Kirkaldy remarks: "Something like *N. americana* Fabr., but with the pattern and colour very obscure. I have very great pleasure in dedicating this species, the first true *Notonecta* from Australia, to Dr. Handlirsch, of the Vienna Museum."

Loc. "Australia." Type in Vienna Museum.

**? NOTONECTA AUSTRALIS Olivier.**

*Notonecta australis* Oliv., Encycl. Method., viii, 1811, p. 389.

*Notonecta* (? *Anisops*) *australis* Kirk., Trans. Ent. Soc., 1897, p. 426.

Kirkaldy, in his "Revision of the Notonectidae. Part I," was unable to trace this species, which he suggests may be an *Anisops*. Olivier's short description is practically confined to colour; in *Enithares bergrothi* the colouring is quite similar.

"Elle se trouve à la Nouvelle Hollande. Du cabinet de M. Bosc."

**ENITHARES Spinola.**

*Enithares* Spin., Ess. Hem., 1837, p. 60; Stål., Hem. Afr., iii, 1865, p. 190; Kirk., Wien. ent. Zeit., xxiii, 1904, p. 95.

*Bothronotus* Fieb., Rhynchotogr., 1851, p. 46.

*Enithara* Sign., Ann. Soc. Ent. Fr., (3), viii, 1860, p. 971.

Type, *E. indica*, Fabr.

Form robust; pronotum wide and short, with a foveate excavation at each anterior angle.

**ENITHARES BERGROTHI Montandon.**

*Enithares bergrothi* Montand., Rev. ent. franc., xi, 1892, p. 75; Kirk., Wien. ent. Zeit., xxiii, 1904, p. 105.

*Enithara australica* Signoret, Samml. (MS.).

?*Bothronotus luniger* Fieber, Abhand. der königl. böhm. Ges. der Wiss. (5), vii, 1852, p. 741. (White form.)

Plate x, fig. 1.

Notocephalon pale, basally wrinkled or punctate and with a low triangular tubercle at hinder margin; punctate on each side towards vertex, and with a line of punctures bordering each eye; vertex twice or a little more than twice as wide as synthlipsis, which is rather less than half the width of an eye. Pronotum black on posterior half, sometimes with the front edge broadly margined with black; foveate excavations ochraceous or black; about 2.5 times wider than long; anterior half densely punctured and finely wrinkled; posterior half smooth and

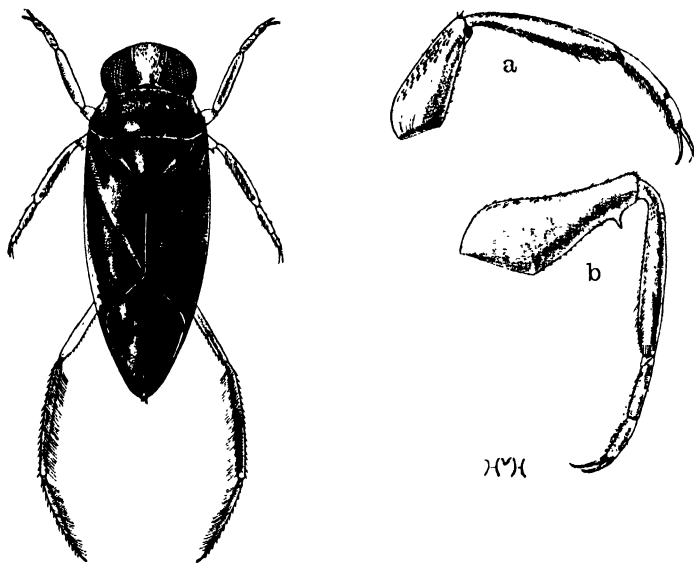


Fig. 370. *Enithares bergrothi*; a and b, anterior and intermediate legs.

polished, with a few small, scattered punctures. Scutellum pale or black, often with an oblique, ochraceous dash of varying shape on each side; about 1.5 times longer than pronotum, densely covered with fine punctures. Hemelytra black, sometimes paler laterally and on claval suture; clothed with tiny hairs; shining and densely covered with minute punctures. First joint of anterior tarsus about twice as long as the second; claws equal, as long as the second tarsal segment;

intermediate femora with a spur or tooth near the apex; intermediate tibiae about 1.5 times longer than the tarsi, the first segment of which is 1.5 times longer than the second; claws unequal, the longer one almost as long as the second tarsal segment. Length, 10 mm. to 12 mm.; width, 3.5 mm. to 4.5 mm.

*Hab.* South Australia: Adelaide, Mount Lofty Ranges, South-Eastern districts, etc., etc. (H. M. Hale), Myponga (A. H. Elston, etc.), Beachport (S. S. Stokes); Northern Australia (Belgium Museum, etc., *fide* Kirk.); Queensland: Kuranda (R. W. Armitage), Cape York (Belgium Museum, etc., *fide* Kirk.); New South Wales: Mittagong (A. M. Lea), Como (W. W. Froggatt); Victoria: Macedon, Melbourne and Plenty River (Searle), Melbourne, etc. (Paris, Stockholm, and Belgium Mus., etc., *fide* Kirk.); Eastern Australia and Tasmania (Paris Mus., *fide* Kirk.); Tasmania (A. Simson); Western Australia (Kirk., "meine Samml."); New Caledonia (type locality); Balade Is. (Paris Mus., *fide* Kirk.).

The colour is variable; pale examples confined in aquaria eventually became black, excepting for the head, legs, and part of the pronotum. The life colouring of a typical adult specimen is as follows:

Notocephalon gray, laterally margined with translucent yellow, posteriorly with a bluish-black triangular marking, the basal angles of which touch the inner posterior angles of the eyes; vertex suffused with bright, dark green (graminaceous); eyes dark rose; beak and face graminaceous, the last-named laterally margined with dark yellow. Pronotum black on posterior half, gray marked with black anteriorly, laterally tinged with green. Scutellum black, with a pale yellow dash on each side. Remainder of upper side black. Underside of abdomen black, with ventral carina and lateral edges graminaceous, and edges of segments castaneous. Upper surfaces of legs green, in parts tinged with yellow; lower surfaces dark green, more or less marked with brown; anterior femora with two dark brown streaks below and posterior femora with a dark brown stripe beneath; hairs brown.

In the living bug the black first appears in patches, which spread until the fine, uniform atrous colour is attained. For instance, on the scutellum a black median streak, or a black triangular patch with its base on the anterior margin of the scutellum, is first apparent; this patch grows larger until only a small pale dash is left on each side (fig. 370), and finally even these pale portions disappear.

This species is taken farther from the banks than is *Anisops*, and rarely congregates in large numbers, as do the last-named backswimmers. It has a habit of clinging to submerged objects or floating at the surface in deep water. Its food consists of any aquatic animal small enough to be mastered, and it has been

observed to capture and feed upon fifth instar nymphs of *Anisops*. The first nymphs of the season appear in early spring.

A resident in the Mount Lofty Ranges, who was recently stung as a result of incautiously handling one of these bugs, remarked that the effect was somewhat similar to that of a bee sting. The poisonous nature of the tiny wound was testified by the swollen condition of the punctured hand.

#### SUB-FAMILY PLEINAE.

#### **PLEA Leach.**

*Plea* Leach, Trans. Linn. Soc., xii, 1817, p. 11; Saund., Hem. Het. Brit. Is., 1892, p. 329; Kirk., Wien. ent. Zeit., xxiii, 1904, p. 126.

*Plou* Stephens, Cat. Brit. Ins., ii, 1829, p. 354.

*Ploca* Doug. and Scott, Cat. Brit. Hem., 1876, p. 61.

Type, *P. minutissima* Fabr. (= *P. leachi* M'Gregor and Kirkaldy).<sup>(4)</sup>

Form stout, size small. Eyes widely separated and rostrum three-jointed. Inner edges of elytra meeting at the median line of the body.

#### **PLEA BRUNNI Kirkaldy..**

*Plea brunni* Kirk., Wien. ent. Zeit., xvii, 1898, p. 141, and xxiii, 1904, p. 128.

Notocephalon ochraceous, about twice as wide as an eye, closely punctate; face usually with a dark castaneous, central, longitudinal line, which is sometimes widened and diffused, sometimes with a dot on each side near vertex, and occasionally forked near vertex, forming a Y-shaped figure; hinder margin of head dark castaneous. Pronotum testaceous or ochraceous, often darkened near humeral angles; 1·3 times wider than its length; coarsely, reticulately punctate, but with a median, longitudinal portion very slightly raised, shining and not punctate. Scutellum dark testaceous or ochraceous, distinctly punctured, hardly half as long as the pronotum. Elytra of like colour, with brown, coarse, reticulate punctures. Wings well developed. Underside black; legs ochraceous; anterior tarsi less than half as long as tibiae; intermediate tarsi about half as long as tibiae; posterior tibiae 1·3 times longer than tarsi, the first joint of which is longer than second; posterior legs distinctly more ciliated than the others, with the claws strong and almost three-fourths of the length of the second tarsal segment. Length, 2 mm. to 2·4 mm.; width, 1 mm. to 1·4 mm.

*Hab.* South Australia: Murray Bridge and Myponga Swamps (H. M. Hale); Northern Territory: Port Darwin; Queensland: Gladstone (A. M. Lea),

(4) Trans. Perthshire Soc., 1899, p. 5.

Cunnamulla (H. Hardeastle), Rockhampton (type locality); New South Wales: Clarence River (A. M. Lea); Tasmania: George Town; Western Australia: Albany (*vide* Kirk.); New Guinea (Mus. Genoa, *vide* Kirk.).

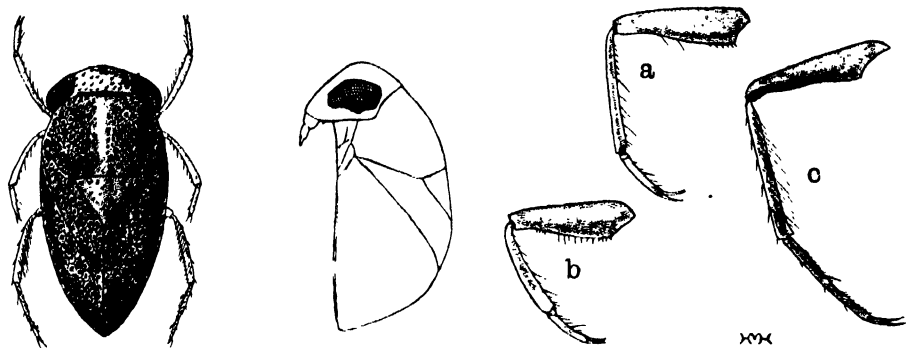


Fig. 371. *Plea brunni*; a, b and c, anterior, intermediate and posterior legs.

The examples from which the above description is made are provisionally referred to Kirkaldy's species; they agree well with the original description, excepting in the proportions of the intermediate legs. Kirkaldy writes: "Mittelschienen ein drittel langer als die Tarsen, erstes Tarsalsegment ein drittel langer als das zweite."

These proportions apply to the *posterior* legs of the specimens before me, so, in preference to risking the creation of useless synonymy, I have regarded these limbs as the ones from which Kirkaldy's measurements were taken.

In the accompanying illustration of the insect, as seen from above, it will be noted that the pronotum, owing to its forward inclination, is foreshortened; its length can be more accurately gauged by a reference to the profile view.

A careful search for members of this genus in South Australia has resulted in the capture of the above species in two localities.

## FAMILY CORIXIDAE.

(This publication, ii, 1922, p. 309.)

In addition to the asymmetrical abdomen, three other male characters are developed in several Corixid genera; these are the facial impression, the palal stridulatory comb, and the strigil, all of which are utilized during copulation, which is conducted underwater. Hungerford remarks that when *Arctocorisa* is *in copula*, "The pegs of the male palac make the embrace more secure, while the

peculiar structure called the strigil, upon the right side of the abdomen, without doubt serves a similar purpose." (5)

The accompanying drawing (fig. 372) shows the apparent function of the large facial impression of *Arctocorisa truncatipala* during copulation; the male clasps the female with the short front legs, while the head is bent down so that the foveate face is closely applied to the rounded back of his consort, thus doubtless affording additional assistance in maintaining his position; a bubble of air is trapped in the space between the head and the prothorax.

### **POROCORIXA HIRTIFRONS Hale.**

Included in a batch of Corixids recently collected by Mr. F. W. Shepherd at Broken Hill, New South Wales, is a good series of *Porocorixa hirtifrons*, previously known only from a few more or less damaged specimens; this locality is, therefore, to be added to the known distribution of the species.

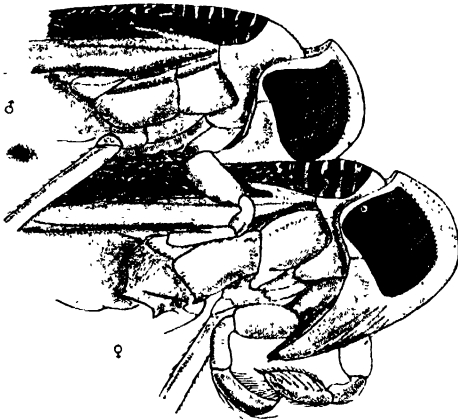


Fig. 372. *Arctocorisa truncatipala* in copula.

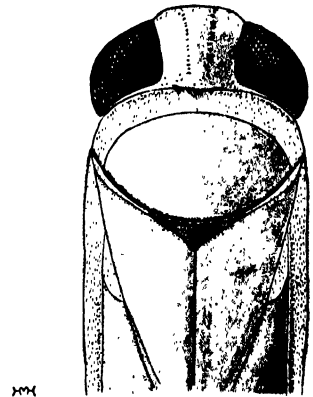


Fig. 373. *Porocorixa hirtifrons*.

The following additional notes are from these fresh examples.

Head pale ochraceous. The sub-elliptical, slightly raised area of the pronotum pale olivaceous-brown, not extending to the lateral edges; the anterior portion, including a broad lateral margin on each side, pale ochraceous; posterior edge very narrowly margined with brownish-black. Posterior angle of scutellum exposed, dull, black. Pegs of male palae twenty-three to twenty-seven. Under-side grey, fading to ochraceous after drying.

(5) Bull. Univ. Kansas, xxi, 1919, p. 229.



From an examination of these undamaged examples it is evident that the head cannot entirely overlap the anterior pale portion of the pronotum; the actual condition is shown in fig. 373.

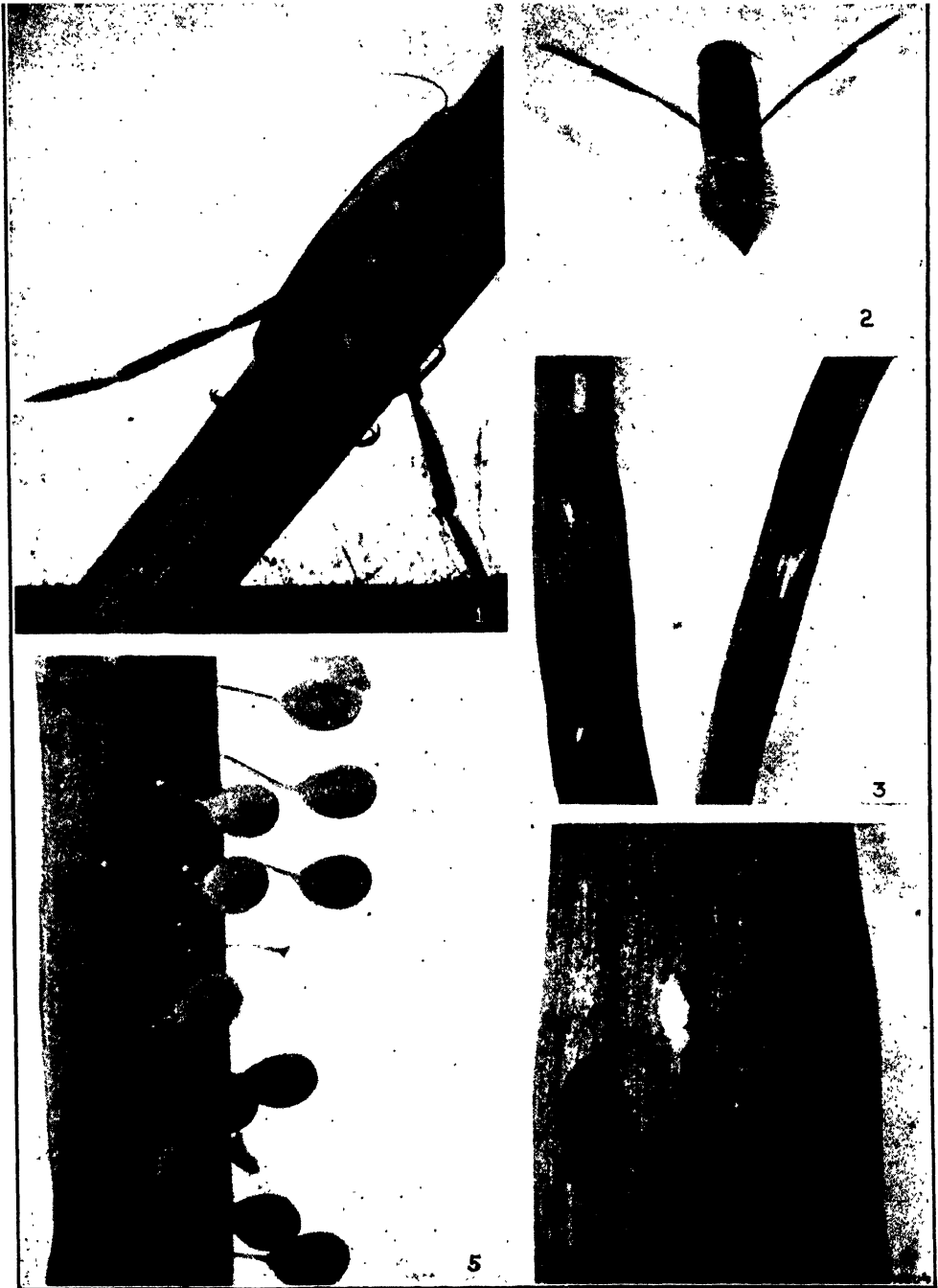
### EXPLANATION OF PLATES.

#### Plate x.

- Fig. 1. *Enithares bergrothi* clinging to plant stem.  
 Fig. 2. *Anisops hyperion*, with guard hairs spread at surface.  
 Fig. 3. Eggs of *Anisops hyperion* partially inserted in leaf of *Vallisneria spiralis*; note the slits denoting abortive attempts to insert the ova in the thin tissue.  
 Fig. 4. Two of the eggs further enlarged; note the eyes of the developing embryo.  
 Fig. 5. Eggs of a Corixid (*Porocorixa curynome?*), for comparison.

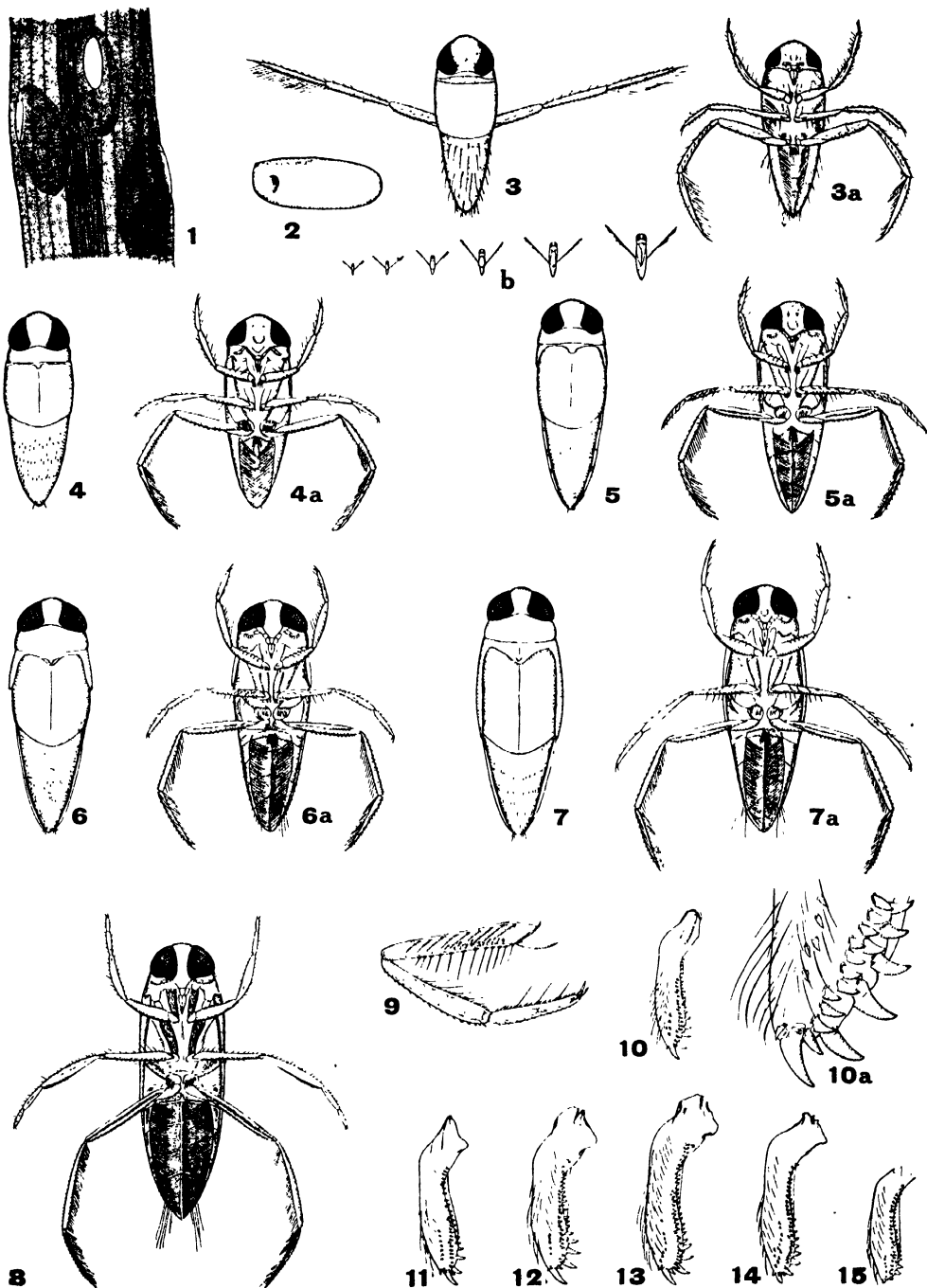
#### Plate xi.

- Fig. 1 to 10. *Anisops hyperion*.  
 Fig. 1. Eggs *in situ* in *Potamogeton* stem; note the exposed portion.  
 Fig. 2. Egg, showing developing eye-pigment, etc.  
 Fig. 3 to 7. Dorsal and (a) ventral views of the five nymphal instars; the actual size from first instar nymph to imago is shown at (b).  
 Fig. 8. Ventral view of adult female.  
 Fig. 9. Intermediate leg of fifth instar nymph, showing the developing imaginal leg as seen through integument; note the two-jointed tarsus within the monomerous tarsus.  
 Fig. 10. The left member of the pair of gouging gonapophyses of the ovipositor; fig. 10a shows the tip of the organ further enlarged.  
 Fig. 11. Left gouging gonapophysis of *Anisops doris*.  
 Fig. 12. " " " " " *gratus*.  
 Fig. 13. " " " " " *stali*.  
 Fig. 14. " " " " " *calcaratus*.  
 Fig. 15. " " " " " *feberi*.



AUSTRALIAN AQUATIC BUGS.





AUSTRALIAN AQUATIC BUGS.



## REVIEW OF AUSTRALIAN MANTIDAE.

By NORMAN B. TINDALE, S. A. MUSEUM.

Plates xii-xxii and Text fig. 374-377.

THE Mantidae herein dealt with comprise specimens taken by me during an extended visit to Groote Eylandt and Roper River, in the Gulf of Carpentaria, together with those in the South Australian Museum.

The descriptions of many of the species previously known were based on either male or female specimens, the other sex being unknown. In a number of instances this deficiency is made good.

Four genera and sixteen species are added, bringing the number of known Australian species to seventy-six.

Some sub-family and group names recently proposed are not adopted, and the practice of some workers of naming species from immature stages is not followed. The types of the species described by Tepper are in the South Australian Museum.

### SUB-FAMILY PERLAMANTINAE.

#### **PARAOXYPILOTUS** Saussure, 1870 (*tasmaniensis*).

#### **PARAOXYPILOTUS TASMANIENSIS** Saussure.

Plate xiii, fig. 9-10, 14.

*Paraoxyphilus tasmaniensis* Sauss., Mitt. Schweiz. Ent. Ges., iii, 1870, p. 227; Mem. Soc. Genève, xxi, 1871, p. 155, pl. i, fig. 49-50.

*Hab.* Tasmania (Type), New South Wales, Victoria, South Australia, Kangaroo Island, and Western Australia.

One of the males figured is from Tasmania, the other from Lillimur, Victoria (mainland specimens have the wings shorter). The female is from Adelaide; it was captured in January, and kept under observation. It deposited an ootheca, the eggs being laid on end alternately in two rows, forming a parallel-sided structure 9 mm. long, 3 mm. high, and 1.5 mm. wide, the whole operation taking less than three hours. The insect died two days later; the colour of the front femora and coxae, in life a brilliant orange-red, faded shortly after death. Sixteen larvae were discovered dead, having emerged in from 30 to 36 days. They measured 3 mm. in length, and were miniatures of the female.

**PARAOXYPIILUS LATICOLLIS** sp. nov.

Plate xiii, fig. 11-13.

♂ Pale yellowish with black markings. Head with fore-margin of clypeus straight, hind-margin arched; facial shield narrow, near antennae excavated; frons with three prominences over ocelli; vertex nearly plain, arched in middle, coarsely punctured, without tubercles or spines; hind marginal projection behind eyes rounded; antennae black, similar to *P. tasmaniensis*. Pronotum shorter and broader than in *P. tasmaniensis*, with supra-coxal spine weaker; markings somewhat similar, but all spines and projections rounded off. Abdomen blackish. Wings hyaline, with dirty whitish and gray transverse marks and blotches, darkest on fore-margins and apex. Anterior coxae dilated, pale yellow, with base black, apex externally black, fore-margin with a spine near base and a marginal series of fine spines; femora pale yellow, apical half internally brownish with light spots; externally brown with darker punctures towards apex; tibiae and tarsi annulated black. Intermediate and posterior legs straw-coloured, annulated brownish-black. Length, 13.5 mm.

♀ Dark brown. Head large, broadly triangular, vertex strongly arched, wide, without spines; clypeus with fore-margin serrated, ocelli very small, prominences of frons weak. Antennae very fine, short. Pronotum almost as wide as long, similar to male, margin with a series of fine spines. Abdomen more pear-shaped than in female of *P. tasmaniensis*, sides only weakly serrated, margins of segments not markedly raised along median line, terminal one triangular. Anterior legs very strong, coloured and marked as in male. Length, 15 mm.

*Hab.* South Australia: Macdonnell Ranges (Captain S. A. White), Lake Callabonna (A. Zietz), Leigh Creek, Umberatana; Western Australia: Cunderdin. Types, I. 14050.

Allied to *P. tasmaniensis*. In the male the head is unarmed, pronotum wider, less armed, and wings much shorter. The female is much broader, head larger, unarmed, pronotum broader and abdomen narrower, less suddenly constricted before apex, and the margins quite different.

**PARAOXYPIILUS KIMBERLEYENSIS** Sjöstedt.

*Paraoxyopilus kimberleyensis* Sjöst., Ark. f. Zool.; xi, 1918, p. 5, pl. iii, fig. 5-7; pl. v, fig. 1.

*Hab.* North-West Australia: Kimberley district (Type female), Fortescue River (W. D. Dodd).

♂ Brownish-black. Head as in female, eyes and ocelli more prominent, ocular spines somewhat less rounded. Pronotum triangular, similar to female, but somewhat rounded at posterior margin. Wings much longer than body, dark brown, hyaline. Anterior legs orange and black, marked as in female; posterior legs light-brownish. Length, 14 mm. Type, I. 14053.

**PARAOXYPIILUS FLAVIFEMUR** Sjöstedt.

*Paraoxyphilus flavifemur* Sjöst., Ark. f. Zool., xi, 1918, p. 3, pl. i, fig. 1a-1d; pl. iv, fig. 3.

*Hab.* Queensland, Northern Territory.

**PARAOXYPIILUS ARMATUS** Giglio-Tos.

Plate xii, fig. 7-8.

*Paraoxyphilus armatus* Gigl.-Tos, Gen. Ins., fasc. 144, 1913, p. 5.

♂ Brownish. Head small, wider than in *P. tasmaniensis*; ocular spines very large and strong. Pronotum well spined, less so than in female, median ridge weakly developed as five isolated spines. Wings long, whitish, hyaline, with veins faintly brown. Anterior coxae strongly developed, with a marginal series of about eight strong spines, with smaller spines between; femora weaker than in female, outer face brownish, inner face light brown. The posterior femora are blackish and tibiae and tarsi light brown. Length, 15 mm. Type male, I. 14054.

*Hab.* Queensland: Thursday Island (Type female), Kuranda; Northern Territory: Groote Eylandt, Melville Island, Daly River.

This species came to lights in my camp on Groote Eylandt on a sultry night in January, in company with hundreds of other insects. The type male figured is from Groote Eylandt, the female from Daly River.

**PARAOXYPIILUS VERREAUXII** Saussure.

Plate xii, fig. 5-6.

*Paraoxyphilus verreauxii* Sauss., Mém. Soc. Genève, xxi, 1871, p. 157; l.c. xxiii, 1872, p. 77; Giglio-Tos, Gen. Ins., fasc. 144, 1913, p. 5, pl. i, fig. 2.

*Hab.* Tasmania (Type), Queensland, Magnetic Island, South Australia.

**PARAOXYPIILUS INSULARIS** sp. nov.

♀ Black with pale brownish markings. Head broad, triangular, vertex arched; fore-margin of clypeus nearly straight, sides diverging, hind-margin



strongly arched; ocelli small, connected by a wide transverse V-shaped ridge as in *P. verreauxii*; above ocelli a small ridge causing a rounded depression on frons; vertex without spines, except posterior marginal spine, which is strongly developed. Pronotum the shape of *P. verreauxii*, tubercles, depressions and elevations absent or ill-defined, scarcely any trace of a median ridge except at posterior extremity, where there is a single large arched elevation, supra-coxal spine strong, margins of pronotum possessing only very feeble spines. Abdomen long, narrow, oval, margins serrated towards posterior extremity, terminal segment triangular, borders not rugose. Anterior coxae weaker than in *P. verreauxii*, not dilated, light flesh-coloured, with several black spots at base, no marginal spines; femora marked externally with dense black spots and strigae, internally dull black with several flesh-coloured blotches on margin; tibiae and tarsi black. Intermediate and posterior legs annulated pale brown. Length, 16 mm.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 14052, unique.

Close to *P. verreauxii*, but distinguished by its less spiny head, arched vertex, and plainer pronotum, with very different median ridge. The abdomen is more slender and not wrinkled. The front coxae are also very different, being quite unarmed. It was taken in the sweep net when beating shrubs on the borders of a creek.

**MYRMECOMANTIS Giglio-Tos, 1913 (atra).**

*Hab.* Australia.

**MYRMECOMANTIS ATRA Giglio-Tos.**

*Myrmecomantis atra* Giglio-Tos, Gen. Ins., fasc. 144, 1913, p. 6.

*Hab.* New South Wales.

**METOXYPILUS Giglio-Tos, 1913 (spinosus).**

*Hab.* New Guinea, Australia.

**METOXYPILUS LOBIFRONS Stal.**

*Paraoxyphilus lobifrons* Stal., Bih. Svenska Akad., iv, 1877, p. 8; Westwood, Rev. Mant., 1889, p. 4; Wood-Mason, Cat. Mant., 1889, p. 2.

*Hab.* Queensland.

**GYROMANTIS Giglio-Tos, 1913 (kraussii).**

*Hab.* Australia.

**GYROMANTIS KRAUSSII** Saussure.

*Haania kraussii* Sauss., Mém. Soc. Genève, xxi, 1871, p. 153; *Paraorypilus kraussii* Stal., Bih. Svenska Akad., iv, 1877, p. 8.

*Hab.* Western Australia, South Australia, and Central Australia, also from the junction of the Fitzroy and Margaret Rivers, North-west Australia.

**GYROMANTIS OCCIDENTALIS** Sjöstedt.

*Gyromantis occidentalis* Sjöst., Ark. f. Zool., xi, 1918, p. 8, pl. i, fig. 2a-2d, 3a-3e.

*Hab.* North-west Australia (Type), Northern Territory, as far south as Tennant Creek.

**PTHERSIGENA** Stal., 1871 (*conspersa*).

*Hab.* Australia.

**PTHERSIGENA CONSPERSA** Stal.

*Phthersigena conspersa* Stal, Oefv. Vet.-Akad. Förh., xxviii, 1871, p. 401;

*Haania conspersa* Sauss., Mém. Soc. Genève, xxiii, 1872, p. 76; *Paraorypilus conspersus* Stal, Bih. Svenska Vet.-Akad, iv, 1877, p. 9.

*Hab.* Queensland.

**PTHERSIGENA MINOR** Sjöstedt.

*Phthersigena minor* Sjöst., Ark. f. Zool., xi, 1918, p. 10, pl. ii, fig. 1a-1e.

*Hab.* North-west Australia.

**PTHERSIGENA CENTRALIS** Giglio-Tos.

*Phthersigena centralis* Gigl.-Tos, Bull. Soc. Ent. Ital., 1914, p. 32.

*Hab.* Central Australia.

This species is about the size of *P. minor*, but the pronotum is relatively larger.

**GLABROMANTIS** Sjöstedt, 1918 (*nebulosa*).

Sjöst., Ark. f. Zool., xi, 1918, p. 12.

*Hab.* Australia.

The females of this genus have the wings short, reaching only to about three-quarters length of abdomen. The head is broad and the eyes less prominent than in male. The antennae are very fine and filamentous, reaching to

the end of pronotum. Pronotum broad, slightly compressed towards posterior extremity. Anterior coxae dilated near base, femora broad, tibial spur shorter, not projecting from outer margin of femur when closed, as in male. Legs annulated dark-brown.

The female of *G. unicornis* has very powerful front legs, which are jet black on their inner face.

### **GLABROMANTIS NEBULOSA** Sjöstedt.

*Glabromantis nebulosa* Sjöst., Ark. f. Zool., xi, 1918, p. 13, pl. ii, fig. 2a-2c.

*Hab.* North-west Australia.

### **GLABROMANTIS UNICORNIS** sp. nov.

Plate xii, fig. 1-2.

♂ Gray, with blackish punctures, spots, and marks. Head somewhat broad, black; eyes oval, projecting outward and forward, sides somewhat compressed; clypeus four-sided, divided across middle by a longitudinal keel; facial shield twice as wide as high, arched strongly in middle, the summit projecting outward in a conspicuous spine-like process; frons rounded over ocelli, ocelli not prominent; vertex plain, a transverse line at middle, and also a median line; hind-margin with a strong, rounded, ocular lobe. Antennae long, strong, basal joint the largest, second and third smaller, fourth very small, the following joints gradually longer. Pronotum  $1\frac{1}{3}$  times long as wide, widest at middle, before middle excavated, front-margin arched; at three-fourths constricted; hind-margin rounded off; a median line conspicuous, a lateral groove before middle and a shallower groove at three-fourths; between antemedian groove and fore-margin a central depression; markings grayish-black. Anterior coxae broadest at base, pale yellowish, with dark punctures on outer side; femora weak, pale yellow, outwardly spotted black, with three discoidal spines, the third small and inconspicuous; inner margin with a large spine, then a fine comb of nine spines, followed by four separated spines, of which the third is largest; outer margin with five spines, the fifth close to apex; tibial spine long, projecting above border of femur when leg is closed, tibia armed on inner margin near apex, with a fine comb of nine spines; outer margin with only traces of a row of spines; first tarsal joint longer than rest together. Legs yellowish with darker markings. Length, 19 mm.

♀ Light brown with black markings. Broader than male. Head and pronotum as in male. Antennae short and filamentous. Wings short, reaching to two-thirds length of abdomen, opaque, strongly marked dirty yellow and black.

Anterior coxae dark yellowish, with black spots; femora strong, inner face shining jet black, spines as in male. Legs as in male. Length, 18.5 mm.

*Hab.* South Australia: Murray River (H. S. Cope), Pungonda (A. Dubbe), Tintinara, Murat Bay, Illamurta (Horn Expedition), Lake Frome (J. N. McGilp). Types, I. 14046.

This species is distinguished from *G. nebulosa* Sjöst. by the peculiar head and the projection on facial shield. The male from Lake Frome is small, measuring only 12 mm. in length. We have seven males and four females.

**GLABROMANTIS UNICORNIS PALLIDIFEMUR subsp. nov.**

♂ Light brown with gray markings. Head very wide, with eyes prominent. Facial shield twice as wide as high, arched above, with apical spine absent or weakly developed, fore-margin straight, at each end of fore-margin a yellowish spot; frons with three prominences over ocelli, the median one well forward, projecting, well rounded; ocular spine pointed, not a rounded lobe. Antennae long, nearly reaching end of abdomen. Pronotum  $1\frac{1}{4}$  times long as wide, oval, sides arched, less conspicuously constricted towards posterior extremity than in *G. unicornis*, black with brownish markings; sometimes a faint light-coloured spot on each side of middle of pronotum below transverse groove. Wings long; elytra hyaline, suffused dirty whitish and black marks; hind-wings hyaline, fore-margin darker. Anterior legs yellowish-brown, externally marked with darker spots; intermediate and posterior legs annulated light-brown. Length, 19 mm.

♀ Larger than male. Pale yellowish, with brownish-black spots and markings. Head large, apex of facial shield forming a small projection, ocelli very small. Pronotum longer than in *G. unicornis*, arched at middle, constricted strongly at three-fourths; markings as in male. Elytra opaque, dirty gray, with black markings; hind-wings hyaline. Anterior coxae pale yellow; femora pale yellow, mottled brownish; legs yellowish, annulated brown-black. Length, 22 mm.

*Hab.* South Australia: Kingoonya (R. Harvey), Mount Painter (H. G. Stokes), North East Corner (F. Parsons). Types, I. 14048.

This has been placed as a race of *G. unicornis*; it has a different shaped head, longer pronotum, and in female pale front femora and tibiae. We have three males and two females.

**GLABROMANTIS MELANIA sp. nov.**

Plate xii, fig. 3.

♂ Dark reddish-brown with dull black markings. Head smaller than in *G. unicornis*; facial shield arched on posterior margin and with a V-shaped

median notch; frons elevated, truncated, prominences well rounded, vertex arched in middle, posterior ocular lobes rounded, small. Antennae fine, about half-length of body. Pronotum black, with reddish-brown prominences, about as long as wide, broadest at middle, constricted before posterior margin, fore-margin gently rounded, surface of pronotum with a median line, a transverse depression before middle, a raised circular area in front of this, with a depressed centre, a transverse depression, and two oblique raised lines on posterior half, forming a raised, equilateral triangle-shaped area. Wings longer than body, narrow, hyaline, with closely set brownish-black markings. Anterior coxae black at base, then pale reddish, at apex black; femora strong, outwardly black, inner face light reddish; tibiae black, tarsi brown; legs reddish-brown. Length, 14.5 mm.

*Hab.* Northern Territory: Pine Creek. Type, I. 14044, unique.

Distinct, by its dark colour, notched facial shield, short body, long slender wings, and bright coloured fore-coxae and femora. It is very different from the figure of *G. nebulosa*, especially in the arched head, less prominent eyes, different contour of pronotum, and the red and black anterior legs.

### **AMORPHOSCELIS Stal, 1871 (annulicornis).**

*Hab.* Africa, extending to India and Borneo.

### **AMORPHOSCELIS PELLUCIDA Westwood.**

*Amorphoscelis pellucida* West., Rev. Mant., 1889, p. 28.

*Hab.* Westwood says of this species: "Habitat Adelaida (Fortnum) in Mus. Hope; alterum e Ceylonia (Thwaites) omnino simillimum accepi." It is probable, however, that the species has been recorded from Australia in error.

### **CLIOMANTIS Giglio-Tos, 1913 (cornuta).**

*Hab.* Australia.

### **CLIOMANTIS CORNUTA Giglio-Tos.**

Plate xii, fig. 4.

*Climantis cornuta* Gigl.-Tos, Gen. Ins., fasc. 144, 1913, p. 12.

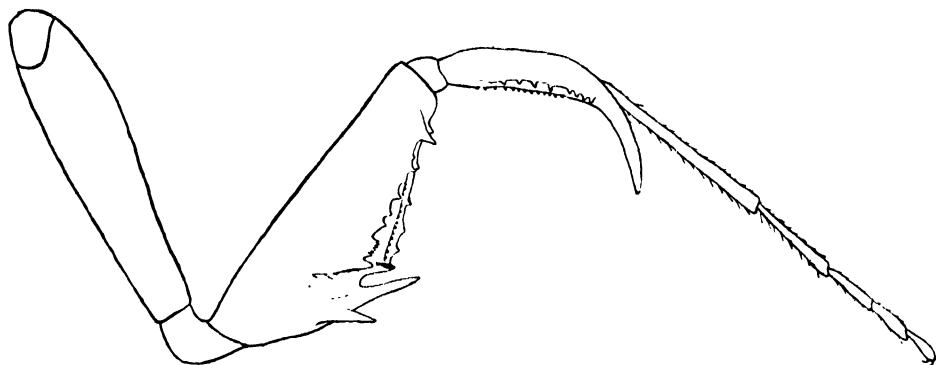
*Hab.* Queensland, Northern Territory.

There are ten males in the Museum collection. The specimen figured is from Darwin; one was taken at lights at Roper River. The female is probably apterous.

**CLIOMANTIS DISPAR** sp. nov.

Plate xiii, fig. 15, and text figure 374.

♂ Dull brown. Head triangular, wide, eyes rounded, clypeus transverse; facial shield strongly transverse; ocular spines less prominent than in *C. cornuta*, and blunt pointed; frons bifurcate. Antennae pale brown, basal joints darker. Pronotum about twice width of head in length, widest anteriorly, sides constricted to middle, where it is slightly dilated, and again constricted before posterior extremity; a slight raised median keel is divided by a transverse shallow groove near middle of pronotum. Abdomen short. Forewings longer than abdomen, hyaline, with numerous fuscous markings more dense along fore-margin; a dark median streak between the veins in basal third of wing; hindwings very long, hyaline, with fuscous markings on fore-margin. Anterior

Fig. 374. *Cliomantis dispar* sp. nov. Left anterior leg of male.

femora somewhat strongly dilated, armed with three discoidal spines, an internal marginal row of thirteen spines, the first strong, the next six forming a fine comb, then six separated spines, of which the apical one is strongest; an exterior marginal series of five spines; there is also in femoral groove a series of about thirteen very fine spines; tibiae armed with an internal marginal row of eight spines, the first four separate, the remainder together at base of tibial spine, also an external marginal series of thirteen very minute spines. Legs long and slender, dark brown. Length, 15 mm.

♀ Grayish brown. Head larger than in male, eyes very prominent, clypeus less transverse, facial shield broad, slightly wider than high. The margin of pronotum less sinuate. Wings absent. Abdomen long, slightly dilated, mottled gray brown, tending to brown at posterior margin of each segment. Legs as in male. Length, 14 mm.

*Hab.* South Australia: Parachilna (Natural History Expedition), Tarcoola, Barton (A. M. Lea), Farina, Ooldea, Todmorton (Captain S. A. White); Central Australia: Carraweena, Trinity (Museum Exped., 1916), Macdonnell and Everard Ranges (Captain S. A. White). Type male, l. 14043; type female, l. 14045.

This species, the males of which we have a long series, appears to be common in the dry parts of the interior of South Australia. The type male is from Parachilna, in the Flinders Range. The female is described from a single specimen, apterous, but apparently mature, taken by Mr. A. M. Lea at Barton, while beating shrubs. The males frequently come to lights.

### **COMPSOTHESPIS Saussure, 1872 (anomala).**

*Hab.* Africa, with one species recorded from Australia.

### **COMPSOTHESPIS AUSTRALIENSIS Wood-Mason.**

*Compsothespis australiensis* Wood-Mason, Cat. Mant., 1889, p. 7, fig. 4; Westw., Rev. Mant., 1889, p. 32, pl. xii, fig. 11.

*Hab.* Queensland and "North Australia."

### SUB-FAMILY EREMIAPHILINAE.

This subfamily is represented in Australia by the genus *Orthodera*. The species are so extremely variable that it is difficult to find satisfactory characters on which to separate them.

### **ORTHODERA Burmeister, 1838 (ministralis).**

*Hab.* This genus is confined to Australia, New Guinea, and New Zealand.

### **ORTHODERA MINISTRALIS Fab.**

Plate xiv, fig. 18-20, and text figure 375.

*Mantis ministralis* Fab., Syst. Ent., 1775, p. 277; *Paraoxyphilus* ? *ministralis* Sauss., Mém. Soc. Genève, xxi, 1871, p. 158; *Orthodera ministralis* Wood-Mason, Cat. Mant., 1889, p. 20; *Orthodera prasina* Burmeister, Handb. Ent., ii, 1838, p. 529; Sauss., Mém. Soc. Genève, xxi, 1871, p. 15; Tepper, Trans. Roy. Soc. S.A., xxix, 1905, p. 238; *Mantis rubrocoxata* Serville, Hist. Nat. Orth., 1839, p. 203; *Mantis hobsonii* Le Guillou, Rev. Zool., 1841, p. 293; *Bolidena hobsonii* Blanchard, Voy. au Pole Sud, iv, 1853, pl. i, fig. 7; *Mantis gunnii* Le Guill., l.c., p. 293; *Orthodera laticollis* Branesik, Jahresh. Nat. Ver. Trencsen. Kom., 1896, p. 246, pl. vii, fig. 5a; *Orthodera australiana*

Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 107; *Orthodera gracilis* Giglio-Tos, l.c., p. 107.

*Hab.* Queensland, New South Wales, Victoria, Tasmania, South Australia, Kangaroo Island, Central Australia, Western Australia, North-west Australia, Northern Territory, Groote Eylandt.

An examination of ninety specimens shows a wide range of variation, and this variation is responsible for the extensive synonymy. The illustrations are a selected series of eight male and twenty female pronoti arranged to show the great variation in the shape of pronotum and head.

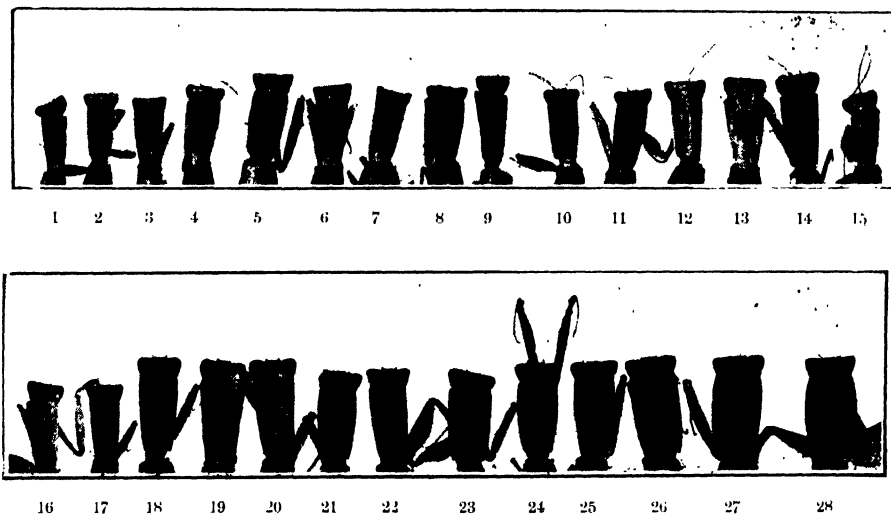


Fig. 375. 1-28. *Orthodera ministralis* Fab. (1, male, Derby, N.W.A.; 2, male, Fortescue River, N.W.A.; 3, female, Flinders Range, S.A.; 4, female, Darke's Peak, S.A.; 5, female, Port Augusta, S.A.; 6, female, S.A.; 7, male, Ellery's Creek, C.A.; 8, female, Karoonda, S.A.; 9, male, Cairns, N.Q.; 10, male, Tasmania; 11, female, Kewell, V.; 12, male Dalby, Q.; 13, male, Darwin, N.T.; 14, female, Darwin, N.T.; 15, male, Groote Eylandt); 16-28, females (16, Tennant's Creek, N.T.; 17, Victoria Desert, C.A.; 18-19, Groote Eylandt; 20, Cairns, N.Q.; 21-22, Dalby, Q.; 23, Dorrigo, N.S.W.; 24, Tasmania; 25-26, Adelaide, S.A.; 27, Ooldea, S.A.; 28, Queensland).

Nos. 1 and 2 are small, and agree with small females (e.g., Nos. 3, 16-17) in having no femoral spot, but Nos. 4 and 8 are intermediate, possessing a small spot. No. 7, which is otherwise inseparable from No. 3, has a large black femoral spot extending over the whole middle area of the femora. No. 9 is more distinct, but females from the same locality are inseparable from the others. No. 10 is *O. hobsonii*, and No. 11 is very close, except that the facial shield is less transverse. No. 9 has the narrowest and longest pronotum, and approaches the figure of *O. straminea* in the shape of the eyes and head. The females show great variation in the proportions of pronotum, generally speaking, southern examples being



broad, but No. 28, from Queensland, is by far the broadest. No. 24 is *O. hobsonii*, female, but differs but little from No. 25, which is a mainland specimen.

This species is wide-ranging, but has not developed clearly defined races. The name, *O. ministralis hobsonii*, may be retained for Tasmanian examples, which appear to have the facial shield transverse.

### **ORTHODERA MARGINATA Saussure.**

Plate xiv, fig. 16-17.

*Orthodera marginata* Sauss., Mém. Soc. Genève, xxxiii, 1872, p. 8, pl. viii, fig. 1; Wood-Mason, A.M.N.H. (4) xx, 1877, p. 76; Tepper, Trans. Roy. Soc. S.A., xxix, 1905, p. 238.

*Hab.* New South Wales, South Australia, Central Australia, and Western Australia.

This species is distinguished by its slender pronotum and the orange fore-margin of elytra. The male figured is from Adelaide, the female from Mount Painter. We have nearly thirty specimens, which do not show any variation towards the other members of the genus.

### **ORTHODERA BURMEISTERI Wood-Mason.**

Plate xiv, fig. 21-22.

*Orthodera burmeisteri* Wood-Mason, Cat. Mant., 1889, p. 21; *Orthodera longicollis* Brancs., Jahresh. Nat. Ver. Trenes., 1897, p. 61, pl. i, fig. 6.

♀ Allied to *O. ministralis*, but differs in being longer and more slender. Head very similar, wider, vertex arched, eyes bluntly pointed; facial shield with corners rounded, ocelli less prominent. Pronotum long, margins nearly smooth, pale silvery green, a median area reddish (in dried specimen). Wings long, pale silvery green, hyaline, fore-margin of front wings reddish. Legs orange, anterior femora with a green area on inner face. Length, 38 mm.

*Hab.* New Guinea (Port Moresby, type); Queensland: Dalby (Mrs. F. H. Hobler).

Our single female agrees very well with the description of this species, which was first recorded from New Guinea. The measurements given in the original description agree, except that in the present specimen posterior femora and tibiae are each 1 mm. shorter.

**ORTHODERINA Sjöstedt, 1918 (straminea).****ORTHODERINA STRAMINEA Sjöstedt.**

*Orthoderina straminea* Sjöst., Ark. f. Zool., xi, 1918, p. 16, pl. iv, fig. 4a-c.

*Hab.* North-west Australia, Northern Territory.

## SUB-FAMILY IRIDOPTERIGINAE.

**BOLBE Stal, 1877 (pygmea).**

*Hab.* Australia.

**BOLBE PYGMEA Saussure.**

*Ameles pygmea* Sauss., Mém. Soc. Genève, xxi, 1871, p. 299; *Bolbe pygmea* Kirby, Cat. Orth. Mant., 1904, p. 226; Sjöstedt, Ark. f. Zool., xi, 1918, p. 17.

*Hab.* Queensland, Western Australia, and North-west Australia (Sjöstedt), Northern Territory.

We have three males of this small mantis, from Darwin and Daly River.

**BOLBE MAIA sp. nov.**

♂ Small, dark brown with lighter markings. Head large, black; frons, from above, prominent, with ocelli forming three projections, vertex almost straight, broad, and smooth. Antennae more than half length of body, black, with numerous setae. Pronotum  $1\frac{1}{2}$  times long as broad, widest before middle, and constricted at three-quarters. Anterior and posterior margins rounded, a transverse furrow, indistinct before middle, surface of pronotum smooth, in some specimens with a slight metallic lustre. Wings hyaline, with transverse black markings, giving wings dark-gray appearance. Abdomen black. Anterior legs wholly bright orange-brown. Intermediate and posterior legs dull brown. Length, 8 mm., of elytra, 8.5 mm.

*Hab.* Groote Eylandt, Northern Territory (N. B. Tindale). Type, I. 14056.

This species, which in life is dark brown, flew freely to lights in my camp at Yetiba, Groote Eylandt, on sultry nights, all through the "wet" season (December to March). It was very active, flying and running around the table and the rim of the lamp, often capturing small flies and other insects which had been attracted to the light. Owing to its quickness it was very difficult to capture. It is the smallest mantis so far known. "Maia" is derived from a Groote Eylandt (Ingura) native word meaning "active." We have a single male from Darwin.

**BOLBE NIGRA** Giglio-Tos.

*Bolbe nigra* Gigl.-Tos, Bull. Soc. Ent. Ital., 1914, p. 35.

*Hab.* South Australia, Central Australia.

The female is wingless. We have a long series of the males of this species. The inner face of front coxae and femora is jet black in both sexes. In 1912, Werner<sup>(1)</sup> identified two larvae, probably of this species, as *Bolbe fuliginosa*.

**BOLBE PALLIDA** sp. nov.

♂ Pale brownish. Close to *B. nigra*, but smaller. Head moderate, with face almost as high as broad; eyes rounded, large, not projecting, the inner margins (viewed from in front) straight; ocelli less prominent, the central ocellus smaller and more rounded, vertex nearly straight, well rounded, forming a transverse ridge behind ocelli. Pronotum much wider than in the other species of genus; a transverse median and postmedian suture dividing pronotum into a number of low rounded ridges. Wings much longer in proportion, pale brownish, hyaline, with light brown veins and veinlets. Anterior legs wholly pale brown, with a few scattered darker brown marks on exterior face of femora. Median and posterior legs pale brown, faintly annulated darker brown. Length of body, 11 mm., of elytra, 13 mm.

*Hab.* Central Australia: Mount Parry (Prof. R. Tate, October, 1889), Finke Gorge (Horn Expedition, 1894), Farina (Museum Expedition, 1916). Type, I. 14055.

We have three males of this small mantis, which is easily distinguished by the peculiar head and eyes, long wings, and pale anterior legs.

**NEOMANTIS** Giglio-Tos, 1914 (*australis*).

*Hab.* Australia.

**NEOMANTIS AUSTRALIS** Saussure and Zehnter.

*Tropidomantis australis* Sauss & Zehn., Grandid. Hist. Madag. Orth., i, 1895, p. 169; *Ncomantis australis* Giglio-Tos, Bull. Soc. Ent. Ital., 1914, p. 48.

*Hab.* Murray Island (Torres Straits).

**STENOMANTIS** Saussure, 1871 (*novae-guineae*).

*Stenomantis* Sauss., Mém. Soc. Genève, xxi, 1871, p. 311.

*Ciulfina* Giglio-Tos, Bull. Soc. Ent. Ital., 1914, p. 64.

*Nanomantis biseriata*, the type of *Ciulfina*, is a subspecies of *N. novae-guineae*, and thus *Ciulfina* is a direct synonym of *Stenomantis*.

(1) Werner, Fauna Sudwest Austral., 1912, p. 49.

**STENOMANTIS NOVAE-GUINEAE Haan.**

*Hab.* New Guinea.

**STENOMANTIS NOVAE-GUINEAE BISERIATA Westwood.**

Plate xv, fig. 27-28.

*Nanomantis biseriata* Westwood, Rev. Mant., 1889, p. 32; *Stenomantis novae-guineae brevis* Werner, Fauna Sudw. Aust., iv, 1912, p. 52.

*Hab.* North-west Australia (Type), Northern Territory, Melville Island, Groote Eylandt, Queensland.

The length of pronotum varies considerably in the series examined; there is only one race, however, represented from Australia. The specimens figured are from Cairns.

**STENOMANTIS LITURGUSA Giglio-Tos.**

*Ciulfinia liturgusa* Gigl.-Tos, Bull. Soc. Ent. Ital., 1914, p. 64.

*Hab.* Queensland, South Australia.

**NANOMANTIS Saussure, 1871 (australis).**

*Hab.* Australia and the Malay Archipelago.

**NANOMANTIS AUSTRALIS Saussure.**

*Nanomantis australis* Sauss., Mém. Soc. Genève, xxi, 1871, pp. 117, 311, pl. vii, fig. 64.

*Hab.* Australia.

## SUB-FAMILY SIBYLLINAE.

**GONATISTELLA Giglio-Tos, 1914 (nigropicta).**

*Hab.* Australia.

**GONATISTELLA NIGROPICTA Westwood.**

*Thecopompa nigropicta* Westw., Rev. Mant., 1889, p. 29, pl. ii, fig. 6; *Gonatistella nigropicta* Giglio-Tos, Bull. Soc. Ent. Ital., 1914, p. 80.

*Hab.* Australia.

## SUB-FAMILY MANTINAE.

**ARCHIMANTIS Saussure, 1869 (latistyla).**

*Hab.* Australia.

**ARCHIMANTIS LATISTYLA Serville.**

Plate xvi, fig. 32; xix, fig. 47.

*Mantis latistylus* Serv., Ins. Orth., 1839, p. 179; McCoy, Prod. Zool. Viet., xiii, 1886, pl. cxxx; *Archimantis latistylus* Sauss., Mém. Soc. Genève, xxi, 1871, p. 39.

*Hab.* South Australia and Western Australia.

**ARCHIMANTIS SOBRINA Saussure.**

Plate xvi, fig. 31.

♂ Smaller than female. Pale green in life. Head smaller, ocelli prominent, antennae long. Pronotum long and broad, shape of female. Wings long, hyaline, immaculate, a greenish tinge on fore-margins. The elytra beneath have at base an anterior marginal black patch, and the reticulation on rest of margin is black. Cerei flat, narrower than in female, the apical joint very long and blunt pointed. Length of body, 90 mm., of elytra, 110 mm.

*Hab.* Western Australia, South Australia, Western Queensland, Northern Territory.

The female figured is from Cunnamulla, and is 99 mm. in length. This is a large, stout species, and seems to be most common in the interior. Males are very similar to those of *A. brunneriana*, but the front femora are much narrower and the pronotum longer.

**ARCHIMANTIS MINOR Giglio-Tos.**

Plate xviii, fig. 39.

*Archimantis minor* Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 43.

*Hab.* Western Australia.

This is a rather small species, of which we have four females from Beverley. The pronotum is very similar to *A. sobrina*, but the wings are short, brown, and with a black discoidal spot.

**ARCHIMANTIS BRUNNERIANA Saussure.**

Plate xviii, fig. 40.

*Archimantis brunneriana* Sauss., Mém. Soc. Genève, xxi, 1871, p. 277; l.c., 1873, pl. viii, fig. 4.

♀ Larger than male. Brown, with darker markings. Head larger, eyes more depressed, divergent, ocelli very small, widely separated, antennae short. Pronotum like male, but broader, and with anterior margins more serrated.

Wings longer than pronotum; elytra opaque, brown, with well developed ante-median and median black spots, reticulations black, fore-margin at base beneath black, and reticulations along margin black, rest of elytra rich brown; hind-wings hyaline, with fore-margin brown. Abdomen light brown, cerci long, flattened, broad, the last segment round. The anterior coxae with five rather small spines on fore-margin. Legs brown. Length of body, 95 mm., of pronotum, 34 mm., of expanded elytra, 76 mm. Murray River (H. S. Cope, Type female, I. 14066).

*Hab.* Queensland, Northern Territory, Central Australia, and South Australia.

The males have a broader pronotum than *A. latistyla*, and are generally green when alive. The females in our long series are all brown.

### **ARCHIMANTIS QUINQUELOBATA** **Tepper.**

Plate xvii, fig. 35-37.

*Fischeria quinquelobata* Tepper, Trans. Roy. Soc. S.A., 1905, p. 238; *Rheomantis quinquelobata* Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 44.

♂ Smaller than female. Pronotum more slender, anterior margin with only very fine serration. Wings long, complete, the elytra with anterior half opaque, brown, with two black spots at one-third, the posterior portion hyaline; hind wings hyaline, brownish on anterior margin and apex. Anterior coxae armed with four (sometimes five) triangular teeth. Length of body, 77 mm., of elytra, 86 mm. Mount Painter (H. G. Stokes, Type male, I. 14067).

*Hab.* South Australia, Central Australia.

The specimen described as a male by Tepper is really a small female. The sexes are very different. The male figure is from Mount Painter, the female (a cotype) from the Fraser Range, where the native name is said to be "kamuan." Giglio-Tos<sup>(2)</sup> has proposed a genus *Rheomantis* for this species, which, however, appears to be a typical *Archimantis*.

### **ARCHIMANTIS ARMATA** **Wood-Mason.**

Plate xvi, fig. 33.

*Archimantis armata* Wood-Mason, Ann. Nat. Hist. (4), xx, 1877, p. 76; Proc. Zool. Soc. Lond., 1878, p. 584, pl. xxxvi, fig. 2-2a.

♂ As large as female, brown. Head smaller, antennae very long and stout at base. Pronotum as long as in female, very slender, somewhat dilated near anterior extremity, posteriorly to dilatation very slender and constricted nearly to posterior margin, margins entirely plain, surface of pronotum smooth.

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(2) Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 44.

Wings long, hyaline, elytra with a narrow fore-marginal opaque area, diminishing towards apex, and with two black spots, not very well defined. Anterior legs shorter and finer than in female. Length of body, 98 mm., of pronotum, 35 mm., of elytra, 56 mm. Cairns (A. M. Lea, Type male, I. 14068).

*Hab.* Queensland.

We have a pair of this species from Cairns. The female agrees with Wood-Mason's figure, except that the spines of pronotum are less densely set and somewhat more blunted in appearance. The apical joint of the cerci is broad and twice as long as wide.

### **ARCHIMANTIS MONSTROSA Wood-Mason.**

Plate xvi, fig. 29-30; xvii, fig. 38.

*Archimantis monstrosa* Wood-Mason, Proc. Zool. Soc. Lond., 1878, p. 583, pl. xxxvi, fig. 1-1b; Westwood, Rev. Mant., 1889, p. 9, pl. iii, fig. 1; *Mantis fuscelytris* McCoy, Prodr. Zool. Vie., xiii, 1886, p. 4; *Archimantis latizonata* Sjöstedt., Ark. f. Zool., xi, 1918, p. 21, pl. vi, fig. 1a-b.

♂ Smaller than female, brown. Antennae very long. Pronotum as in female, but slightly less dilated, margins strongly serrated. Wings long, hyaline, the fore-margin of elytra reticulated black, and with black spots as in the other sex. Legs concolorous. Length of body, 93 mm., of pronotum, 32 mm., elytra, 54 mm. Roper River (H. E. Warren). Type, male, I. 14069.

*Hab.* Northern Territory: Victoria River (type), Darwin, Stapleton, Roper River, Groote Eylandt, North-west Australia.

The first female from Groote Eylandt (fig. 29) has the pronotum shaped as in the figure of the type. The other specimen (from Roper River) has the pronotum very strongly dilated, and this seems to be the more usual form in the Northern Territory. Sjöstedt's figure of a "male" larva agrees with other larvae of this species in our big series.

### **ARCHIMANTIS STRAMINEA Sjöstedt.**

*Archimantis straminea* Sjöstedt., Ark. f. Zool., xi, 1918, p. 17, pl. v, fig. 4a-b; pl. vi, fig. 2a-3.

*Hab.* North-West Australia.

### **NULLABORA gen. nov.**

Head twice as wide as high, very narrow, concave in front, eyes tapering to a blunt point, vertex straight, eyes depressed, clypeus quadrilateral, fore-margin excavated, facial shield transverse, sides and upper margin sinuate, frons trans-

versely excavated, straight. Antennae fine, ocelli small (female). Pronotum six times longer than wide, fore-margin rounded, a slight constriction, then a slight dilatation before one-third, thence sides parallel to posterior angle, which is a trifle dilated, margins delicately serrate, surface of pronotum smooth. Wings transparent, as long as abdomen. Abdomen moderately slender, parallel-sided, cerci broad, flat, with eleven apparent joints, hairy, apical joint triangular. Anterior coxae long, flattened, thin, margins weakly spined; femora long, armed with four discoidal spines, the second small, third large, inner margin with fifteen spines, outer margin with four, tibia with 14–15 inner and 10–11 outer marginal graduated spines; first joint of the tarsi longer than four following together.

Type, *Nullabora flavoguttata*, from the Nullabor Plains.

In this genus the female is fully winged. The male is unknown.

### NULLABORA FLAVOGUTTATA sp. nov.

Plate xviii, fig. 41, and text figure 376.

♀ Yellowish-green with purplish-brown markings (in dried specimen). Head with frons depressed, whitish. Pronotum smooth, greenish, with a sub-

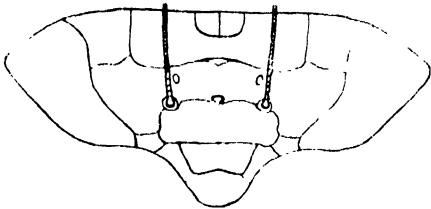


Fig. 376. *Nullabora flavoguttata* sp. nov.  
Head of female.

marginal border of purplish-brown, interrupted at the supracoxal dilatation. Prosternum with broad longitudinal band, black. Wings transparent, fore-margin of elytra green, with a dark sub-marginal line. Abdomen greenish, above with a dark central line of purplish-brown, beneath, at the base of segments 2 to 5, a large median orange spot sur-

rounded by a triangular area of purplish-brown; cerci brownish-black, hairy. Legs greenish, inner face of anterior coxae pale purple. Length, 66 mm., pronotum, 23 mm., wings, 40 mm.

*Hab.* South Australia: Kingoonya (R. Harvey, Type, I. 14070); Northern Territory (Capt. S. A. White).

This peculiar mantis from the desert plains of the north-west of South Australia is probably a grass-frequenting species. It is not apparently close to any other species.

### RHODOMANTIS Giglio-Tos, 1916 (pulchellus).

*Rhodomantis* Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 45.

*Truxomantis* Sjöstedt, Ark. f. Zool., xi, 1918, p. 31.



**RHODOMANTIS PULCHELLA** **Tepper.**

Plate xv, fig. 26.

*Pseudomantis pulchellus* Tepper, Trans. Roy. Soc. S.A., 1904, p. 163; *Truromantis kimberleyensis* Sjöst., Ark. f. Zool., xi, 1918, p. 33, pl. iii, fig. 4; pl. v, fig. 6.

*Hab.* South Australia, Western Australia, North-west Australia. Type, I. 13779.

The type, a female, of this species came from the far N.W. of South Australia (Wells Expedition, March, 1903). It is in rather damaged condition. We have a series of seven males and four females. They agree well with Sjöstedt's description and figures. The figure is of a male from Mount Painter.

**RHODOMANTIS QUEENSLANDICA** **Sjöstedt.**

*Truromantis queenslandica* Sjöst., Ark. f. Zool., xi, 1918, p. 31, pl. iii, fig. 3; pl. v, fig. 5.

*Hab.* Queensland.

**RHODOMANTIS GRACILIS** **sp. nov.**

Plate xv, fig. 25.

♂ Pale brown. Head similar to *R. pulchella*, ocelli less prominent, antennae much finer. Pronotum very slender, much longer, supracoxal dilatation well forward, margins of pronotum finely serrated, the stem with a median and two lateral longitudinal ridges, armed with coarse spinules. Wings shorter, narrow, reaching two-thirds length of abdomen; elytra hyaline, brownish, with fine scattered blackish spots; hind-wings hyaline, a basal area brownish black, becoming paler outwardly, and with scattered transverse hyaline patches. Cerci longer, and more slender. Legs very long, fine, the anterior femora very slender at base. Length, 43 mm., pronotum, 13 mm., elytra, 19 mm.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale), Connexion Island (April, 1922). Type, I. 14063.

Close to *R. pulchella*, from which it differs in its smaller size, longer pronotum, shorter wings, darker base to wings, in the cerci, and the slender femora, not dilated towards base; while the antennae are very much finer. We have two males; one was taken with the sweep net in tall grass on a small coral island west of Groote Eylandt, and the other at Emerald River, Groote Eylandt. The type is figured.

**TENODERA** **Burmeister, 1838** (*aridifolia*).

*Hab.* Ethiopian, Oriental, Malayan regions, and Australasia.

**TENODERA INTERMEDIA** Saussure.

Plate xxi, fig. 54.

*Tenodera intermedia* Sauss., Add. Syst. Mant., 1870, p. 233; Mém. Soc. Genève, xxi, 1871, p. 98; Gigli-Tos, Bull. Soc. Ent. Ital., 1911, p. 41; *Tenodera superstitiosa bokiana*, Sjöst., Ark. f. Zool., xi, 1918, p. 22, pl. iv, fig. 5a-b.

*Hab.* Queensland, Northern Territory (Roper River), New Zealand, and New Guinea.

The rather poor example figured is a female from Emerald, Queensland.

**TENODERA AUSTRALASIAE** Leach.

Plate xxi, fig. 55.

*Mantis australasiae* Leach, Zool. Misc., i, 1814, pl. xxxiv; Saussure, Mém. Soc. Genève, xxi, 1871, p. 96; *Mantis darchii* Macleay, King's Survey Aust., ii, 1827, p. 454; *Mantis tessellata* Burm., Handb. Ent., ii, 1838, p. 535.

*Hab.* Australia and Tasmania, New Zealand, New Guinea, and the Molucca Islands.

This is a common species all over Australia; the specimen figured is from Adelaide. The sexes are similar, the male being smaller, and the colour is either grayish-brown or bright green. One specimen taken by the author near Adelaide has the hind-wings almost entirely dark, except for a small area in the centre.

**SPHRODROPODA** Stal, 1877 (*tristis*).

*Hab.* Australia.

**SPHODROPODA TRISTIS** Saussure.

Plate xix, fig. 48.

*Mantis tristis* Sauss., Mém. Soc. Genève, xxi, 1871, p. 93; *Sphodropoda tristis* Westwood, Rev. Mant., 1889, p. 13, pl. x, fig. 2, 9.

*Hab.* Fiji, Queensland, South Australia, Victoria.

There are one male and four females in the collection from South Australia, the female figured is from Mount Bryan (Victoria), and is dark-brown in colour. Giglio-Tos describes the sexes as green, but otherwise agreeing, from Cape York. It is probable that many of the species of *Sphodropoda* and allied genera are dimorphic.

**SPHRODROPODA MOESTA** Giglio-Tos.

*Sphodropoda moesta* Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 16.

*Hab.* Cape York.

This appears to be the dark form of *S. tristis*, and the description agrees with specimens so labelled in our collection.

### **SPHODROPODA VIRIDIS sp. nov.**

Plate xvii, fig. 34.

♂ Green. Close to *S. tristis*. Head similar, fore-margin of facial shield straight. Shaft of pronotum longer and more slender, prosternum greenish. Wings hyaline, fore-margins opaque, greenish. Fore-wings with stigma obscure, not marked with black, fore-margin beneath reddish. Base of each segment of abdomen beneath with a black median spot, as in *S. tristis*, cerci long, slender, hairy. Anterior coxae green, with a front marginal row of small spines; femora similar to *S. tristis*, two pale brown dots on inner margin, inner face of tibia black. Legs short, stout, green. Length, 41 mm., pronotum, 11 mm., fore-wing, 35 mm.

*Hab.* South Australia: Mount Painter, Flinders Range (H. G. Stokes). Type, I. 14061.

Allied to *S. tristis*, from which it is distinguished by the different anterior coxae and green colour.

### **SPHODROPODA MJOBERGI Sjöstedt.**

*Sphodropoda mjobergi* Sjöst., Ark. f. Zool., xi, 1918, p. 25, pl. v, fig. 2, 3.

*Hab.* North-west Australia (Type), Northern Territory (Roper River), Melville Island, Groote Eylandt.

Most of the specimens are dark in colour; we have one female from Point Charles which is green, but is not otherwise distinguishable.

### **SPHODROPODA LORIPES sp. nov.**

Plate xyiii, fig. 42.

♂ Small, green. Head somewhat triangular, vertex nearly straight, clypeus narrow, transverse, quadrilateral, margins straight, facial shield transverse, five-sided, fore-margin straight, eyes projecting, antennae moderately fine. Pronotum somewhat shape of *S. tristis*, but much narrower and longer in proportion, margins not serrated, surface of pronotum smooth. Wings hyaline, fore-margins opaque, green. Anterior coxae unarmed; femora with four discoidal spines, an interior marginal row of sixteen spines, the first eleven nearly equal sized, the twelfth, fourteenth, and fifteenth small, sixteenth large (in *S. tristis* the spines are alternately large and small), and an outer marginal row of four rather small spines;

tibia armed internally with thirteen, and externally with eleven spines. Legs short, stout, green. Length, 40 mm., pronotum, 13 mm., fore-wing, 30 mm.

♀ Green. Much larger than the male. Head larger, more rounded, vertex strongly arched, eyes less prominent, antennae very fine, ocelli small. Pronotum nearly the shape of *S. tristis* female, but narrower in front, margins serrated. Wings long, broad, opaque, green, traces of a stigma green, margin of fore-wing beneath red. Abdomen rather broad, green. Anterior coxae with a row of about eleven fore-marginal spines; femora armed on inner margin with fifteen spines, arranged as in male; tibia with nine external and thirteen internal marginal spines. Inner face of first tarsal joint black, except at base. Legs green. Length, 52 mm., pronotum, 17 mm., fore-wing, 36 mm.

*Hab.* Queensland: Cunnamulla (H. Hardeastle). Types, 1. 14071.

This distinct species, of which we have two examples, is allied to *S. tristis*.

### NGAWALA gen. nov.

Allied to *Sphodropoda*. Head more compressed, facial shield not transverse. Male with wings long, the margins straight, and with a long median opaque stigma on elytra. Females with wings abbreviated, rounded, reaching two-thirds length of abdomen; costal margin of elytra strongly rounded. Anterior tibiae armed externally with thirteen spines, the thirteenth very small.

Type, *Hierodula dentifrons* Stal.

This genus is intermediate between *Parhierodula* and *Sphodropoda*. The name is derived from a native word, "ngawal" (Kakurera tribe), meaning "mantis."

### NGAWALA DENTIFRONS Stal.

Plate xviii, fig. 43-44; xix, fig. 49.

*Hierodula dentifrons* Stal, Bih. Svenska Akad., iv, 1877, p. 56; *Sphodropoda dentifrons* Kirby, Cat. Mant., 1904, p. 242.

♂ Smaller than female. Head and pronotum similar, the margins of pronotum faintly serrated. Wings longer than abdomen; elytra narrow, hyaline, fore-margin green, the hind wings wide, hyaline, the fore-margin green. Anterior coxae green, femora green, with three brown spots on inner margin of femur, and a median brown area. Legs greenish. Length of body, 60 mm., of pronotum, 18 mm., expanse of elytra, 96 mm. Darke Peak, South Australia (R. G. Walsh). Type, male, 1. 14059.

*Hab.* South Australia, Central Australia, and Western Australia.

The typical form has a large ferrugineous spot on the inner face of the front femora. In eight female specimens from the interior this is absent.

**PARHIERODULA Giglio-Tos, 1911 (venosa).**

*Hab.* Australasia, extending as far west as Wallace's line.

**PARHIERODULA PUSTULIFERA Wood-Mason.**

Plate xviii, fig. 45; xxi, fig. 52.

*Rhombodera pustulifera* Wood-Mason, Proc. Zool. Soc. Lond., 1878, p. 583, pl. xxxvi, fig. 6, 6a; *Parhierodula pustulifera* Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 124.

♂ Smaller than female, green. Head and pronotum similar, antennae somewhat longer, the margins of pronotum plain. Wings longer, hyaline, the elytra much narrowed, with fore-margin less dilated and opaque. Anterior legs orange-coloured on inner face, coxal spines blunt, small, and somewhat widely separated. Length of body, 59 mm., pronotum, 18 mm., elytra, 41 mm. Darwin (W. K. Hunt). Type, male, I. 14062.

*Hab.* Queensland (Torres Strait Islands, type), Northern Territory, Groote Eylandt, Bouru, Obi, and Ké.

The female illustrated was taken on Groote Eylandt. It measures 74 mm. in length.

**PARHIERODULA STERNOSTICTA Wood-Mason.**

*Hierodula sternosticta* Wood-Mason, Journ. Asiat. Soc. Beng., li, 1882, p. 31; *Parhierodula sternosticta* Gigl.-Tos, Bull. Soc. Ent. Ital., 1911, p. 114; *Hierodula biroi* Brancsik, Ser. Orth. nov., 1897, p. 61, pl. i, fig. 7a-b; *Hierodula punctipectus* Brunner, Orth. Mal. Arch., 1898, p. 212, pl. xvi, fig. 18.

*Hab.* Australia: Trinity Bay (Wood-Mason), New Guinea.

**PARHIERODULA QUINQUEDENS Macleay.**

Plate xxi, fig. 53.

*Mantis quinquedens* Macl., King's Survey Aust., ii, 1827, p. 454; *Hierodula quinquedens* Saussure, Mém. Soc. Genève, xxi, 1871, p. 78; xxiii, 1873, p. 42, pl. viii, fig. 8, 8a; Wood-Mason, Journ. Asiat. Soc. Bengal, li, 1882, p. 28; *Sphodropoda quinquedens* Kirby, Cat. Mant., 1904, p. 242.

*Hab.* Queensland, Northern Territory, Groote Eylandt.

A Groote Eylandt female is figured. This species is somewhat aberrant, and shows relationship with *Sphodropoda*, but is best retained in the above genus.

**PARHIERODULA DIMORPHA** Werner.

*Hierodula dimorpha* Werner, Abh. Senckenb., xxxiii, 1911, p. 394.

*Hab.* New South Wales.

**PARHIERODULA WERNERI** Giglio-Tos.

*Parhierodula werneri* Giglio-Tos, Bull. Soc. Ent. Ital., 1911, pp. 112, 128; Sjöstedt, Ark. f. Zool, xi, 1918, p. 28.

*Hab.* Ké Island (Type), North-West Australia.

**PARHIERODULA ATRICOXIS** Wood-Mason.

*Hierodula (Rhombodera) atricoris* Wood-Mason, Proc. Zool. Soc. Lond., 1878, p. 582, pl. xxxvi, fig. 4-4b; *Mantis atricoris* var. *grandis* Wood-Mason, Journ. Asiat. Soc. Bengal, li, 1885, p. 31.

*Hab.* Queensland.

This species is described as having the pronotum strongly dilated in middle and the "whole inner surface of the fore coxae coloured jet black, and the hinder part of the prosternum and the mesosternum symmetrically marked with the same colour."

**PARHIERODULA MAJUSCULA** sp. nov.

Plate xx, fig. 50-51.

♀ Allied to *P. pustulifera*, but larger. Green, the head wider, vertex less strongly arched, eyes more prominent. Pronotum similar in shape, but constricted posteriorly more than in that species. Prosternum green. Wings broad, well rounded; the elytra opaque, pale green, with veins darker green; hindwings hyaline, the apex pale green. Abdomen yellowish, the cerci coarse and not tapering to apex so gradually as in *P. pustulifera*. Anterior coxae green, inner face with base and apex orange, and the middle broadly jet black, foremargin with a row of sharp, oblique, coxal teeth; femora green, with inner face orange-yellow. Legs green. Length of body, 95 mm., pronotum, 30 mm., expanse of elytra, 113 mm.

*Hab.* North Queensland: Cairns (A. M. Lea). Type, I. 14058.

No other species of the genus has black and orange front coxae. In *P. atricoris* the coxae are said to be entirely black on inner face, but the pronotum is figured as of a widely different shape. The prosternum is without markings. This is probably one of the largest Australian mantids. The females figured are from Cairns, and the specimen showing the reverse is the type.

**PSEUDOMANTIS Saussure, 1869 (albofimbriata).***Hab.* Australia.**PSEUDOMANTIS ALBOFIMBRIATA Stal.**

Plate xiv, fig. 23-24.

*Mantis albofimbriata* Stal, Eugenie's Resa. Ins., 1858, p. 312; *Pseudomantis albofimbriata* Sauss., Mém. Soc. Genève, xxi, 1871, p. 34, pl. iv, fig. 7; Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 57.

♂ Smaller than female, green. Head as in female, eyes more prominent, antennae longer, ocelli prominent. Pronotum similar, without marginal serrations. Wings, long, greenish, hyaline, with fore-margins opaque. Anterior femora weaker, with a large black spot on inner face. Length of body, 36 mm., of pronotum, 11 mm., of elytra, 28 mm.

*Hab.* Tasmania (Type), New South Wales.

The figures show a female from Sydney and the inner face of a male anterior leg. Both sexes have a black spot on the inner face of the front femora.

**PSEUDOMANTIS VICTORINA Westwood.**

*Pseudomantis victorina* Westw., Rev. Mant., 1889, p. 36, pl. ix, fig. 6.

*Hab.* North Australia.**PSEUDOMANTIS HARTMEYERI Werner.**

*Pseudomantis hartmeyeri* Werner, Fauna Sudw. Austral., iv, 1911, p. 51.

*Hab.* Western Australia.

This species, which was described from larvae, is unknown to me.

**STATILIA Stal, 1877 (nemoralis).***Hab.* Malay Archipelago.

*S. apicalis* is known from Australia, New Guinea, and Africa, a strange case of discontinuous distribution.

**STATILIA APICALIS Saussure.**

*Mantis apicalis* Sauss., Mém. Soc. Genève, xxi, 1871, p. 291; i.e., xxiii, 1872, p. 48; *Statilia apicalis* Stal, Bih. Svenska Akad., iv, 1877, p. 55; Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 9; *Pseudomantis apicalis* Kirby, Syn. Cat. Orth, 1904, p. 235.

*Hab.* New South Wales, Queensland.**MANTIS Linnaeus, 1758 (religiosa).***Hab.* Europe, Asia, Africa, and one species from Australia.

**MANTIS OCTOSPILOTA Westwood.**

Plate xxii, fig. 58.

*Mantis octospilota* Westw., Rev. Mant., 1889, p. 35; Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 15.

*Hab.* North-west Australia, Western Australia, North-west of South Australia, Queensland, Northern Territory.

The male is figured. The female is larger than the male, and has the wings more opaque. Both sexes have a black spot at the base of inner face of fore-coxae, and the prosternum is also suffused black. It was first described from Adelaide. Specimens from Roper River have the black spots widened into short lateral black bars.

**AUSTROMANTIS Sjöstedt, 1918 (albomarginata).**

*Hab.* Australia.

**AUSTROMANTIS ALBOMARGINATA Sjöstedt.**

*Austromantis albomarginata* Sjöst., Ark. f. Zool., xi, 1918, p. 28, pl. iii, fig. 1-2.

*Hab.* North-west Australia, Northern Territory, Groote Eylandt.

**AUSTROMANTIS GRACILIS Sjöstedt.**

*Austromantis gracilis* Sjöst., Ark. f. Zool., xi, 1918, p. 30, pl. iv, fig. 1.

*Hab.* Western Australia, North-west Australia, Groote Eylandt.

**NOTOMANTIS gen. nov.**

Allied to *Mantis*. Head with vertex straight, eyes prominent, divergent, facial shield strongly transverse. Pronotum with sides depressed, the anterior portion constricted and forming a median ridge. Wings (in the male) rather long, hyaline, the fore-margin of elytra rounded, with traces of a stigma. Abdomen short, the cerci small. Anterior coxae armed with small teeth; the femora rather strong, armed with four short discoidal spines, an inner marginal series of fourteen irregular small spines, and an outer marginal series of four larger spines; tibiae armed externally with eight, internally with eleven graduated spines. Legs long and slender.

Type, *N. chlorophana* sp. nov.

**NOTOMANTIS CHLOROPHANA sp. nov.**

Plate xxii, fig. 57.

♂ Green. Head green, antennae long, stout, black, except at base. Pronotum green, smooth, the margins darker. Wings green, hyaline, the fore-margins opaque, the apex tipped black; the fore-margin of elytra beneath black. Anterior legs green, the apex of coxae and an obscure patch on inner face of



femora darker. Legs green, the base of femora darker green. Length of body, 41 mm., of pronotum, 12 mm., expanse of elytra, 70 mm.

*Hab.* Western Australia: Beverley (F. H. du Boulay). Type, I. 14072, unique.

**TRACHYMANTIS Giglio-Tos, 1916 (obesa).**

**TRACHYMANTIS OBESA Giglio-Tos.**

*Trachymantis obesa* Gigl.-Tos, Bull. Soc. Ent. Ital., 1916, p. 46.

*Hab.* Australia. ♀

This species is recorded: "da Hermannsburg nell Africa centrale (Maus Londra)." Hermannsburg is between Oodnadatta and Charlotte Waters, Central Australia.

**DEIPHOBE Stal, 1877 (ocellata).**

*Hab.* India and Australia.

**DEIPHOBE AUSTRALIANA Giglio-Tos.**

*Deiphobe australiana* Gigl.-Tos, Bull. Soc. Ent. Ital., 1915, p. 24.

*Hab.* Australia.

**THORODIA gen. nov.**

Male with head moderately large, about as high as wide, eyes rounded, prominent; vertex strongly arched; facial shield transverse, elevated above; clypeus quadrilateral; sides diverging, hind margin nearly straight; ocelli large, closely

grouped together. Pronotum about four times long as wide; widest at one-fourth, margins anteriorly serrate, a moderate median ridge. Wings long, nearly reaching tip of abdomen, hyaline, coloured. Abdomen slender, parallel-sided, anal appendages large; cerci stout, short, cylindrical, with nine apparent joints, apical joints compressed, clothed with moderately dense setae. Anterior femora moderate, with four discoidal spines, the second very small, also an inner marginal row of fourteen nearly equal spines and an isolated apical spine, outer

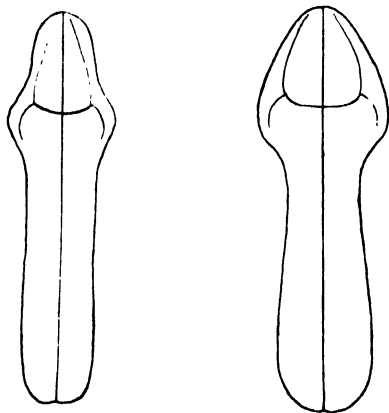


Fig. 377. *Thorodia melanoptera* sp. nov. ♀,  
and *T. m. major* subsp. nov. ♀.

margin armed with five spines, the second the largest; and the fifth at apex; tibiae armed on inner margin with thirteen graduated spines, the outer with seven or eight; tarsi short, first joint as

long as four following, clothed with fine hairs. Legs slender and rather long. The female is larger, stouter, the pronotum more dilated, wings short, only half length of abdomen, hyaline, coloured, hind-wings semiovalate, as wide as long.

Type, *T. melanoptera* sp. nov.

**THORODIA MELANOPTERA** sp. nov.

Plate xviii, fig. 46; xxii, fig. 59, and text figure 377.

♂ Brown. Head about as high as wide; clypeus transverse, quadrilateral; facial shield transverse, fore-margin concave, hind-margin produced to a point; ocelli large, rounded, close together; vertex arched, the middle a trifle flattened, forming an elevated transverse rounded ridge, mottled brown. Pronotum narrow, somewhat sparsely punctured in longitudinal rows; a supracoxal dilatation at one-third. Elytra long, hyaline, pale brownish; hind-wings large, hyaline, brownish black, with numerous short transverse whitish lines, fore-margin straight, blackish, opaque, interior to this the wing is very transparent, darkening towards posterior margin. Abdomen brownish, slender, cylindrical, cerci stout, flattened at apex, clothed with fairly dense setae. Fore-coxae margined in front with six weak spines, inner face light brown, with several transverse blackish bands more or less obscure, outer face brownish. Femora brown, sometimes an obscure black spot in femoral groove. Legs brown. Length, 47 mm., elytra, 32 mm., hind-wings, 29 mm.

♀ Dark brown. Head as in male, but larger, ocelli smaller. Pronotum broad, strongly dilated, a slight constriction between supracoxal dilatation and fore-margin. Fore-wings short, rounded, opaque, brownish, with darker veins. Hind-wings short, as wide as long, black, with transverse, short, transparent, whitish lines at veins. Abdomen broad, parallel-sided, brown, cerci coarse, cylindrical, setose, the two apical segments flattened. Anterior coxae and femora mottled brown and black. Legs brown. Length, 61 mm., elytra, 19 mm., hind-wings, 14 mm.

*Hab.* South Australia: Murray River (H. S. Cope), Mindarie, Fowler Bay, Port Augusta, Alford, Halidon, Lameroo, Adelaide, Lucindale (A. M. Lea); Victoria: Kewell.

Types, I. 14064.

**THORODIA MELANOPTERA MAJOR** subsp. nov.

Plate xxii, fig. 60; and text figure 377.

♂ Similar to *T. melanoptera*, but larger, head more arched, vertex rounded, smooth; pronotum much wider in proportion, fore-margin narrowed, and the

constriction between fore-margin and the dilatation nearly obsolete. Wings with hyaline transverse marks, generally wider and a trifle more obscurely margined. Length, 58 mm.

♀ Head strongly arched, smooth, no plane area on vertex. Pronotum wider, from supra-coxal dilatation to fore-margin convex, broad, behind dilatation strongly constricted, thence widening to posterior margin, the tubercles on pronotum coarse and conspicuous. The legs appear to be stouter and longer. Length, 65 mm.

*Hab.* South Australia: Kingoonya (R. Harvey), Ooldea (R. T. Maurice); Central Australia: Macdonnell Ranges and Mereenie Bluff (Horn Expedition). Types, I. 14065.

The males of this desert race of *T. melanoptera* differ most in size, and the females in the shape of the pronotum. We have big series of both races, and there seem to be no intermediates.

#### SUB-FAMILY VATINAE.

### **PARADANURIA Wood-Mason, 1877 (*orientalis*).**

*Hab.* India and Australia.

### **PARADANURIA FORTNUMI Westwood.**

*Toroderia (Paradanuria) fortnumi* Westw., Rev. Mant., 1889, p. 41, pl. viii, fig. 7.

*Hab.* North Australia.

### **AUSTROVATES Sjöstedt, 1918 (*variegata*).**

*Hab.* Australia.

### **AUSTROVATES VARIEGATA Sjöstedt.**

Plate xxi, fig. 56.

*Austrovates variegata* Sjöst., Ark. f. Zool., xi, 1918, p. 36, pl. iv, fig. 2a-b;

*Heterarchimantis lobata* Wern., Zool. Med. Rijks Mus. Leid., vii, 1922, p. 121.

*Hab.* North-west Australia, Northern Territory.

The figure is of a female from Roper River.

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**EXPLANATION OF PLATES.****Plate xii.**

- Fig. 1. *Glabromantis unicornis* sp. nov. Type male.  
2. *Glabromantis unicornis* sp. nov. Type female.  
3. *Glabromantis melania* sp. nov. Type male.  
4. *Clomantis cornuta* Gigl.-Tos., Darwin, male.  
5. *Paraoxypilus verreauxii* Sauss., Magnetic Island, male.  
6. *Paraoxypilus verreauxii* Sauss., Emerald, female.  
7. *Paraoxypilus armatus* Giglio-Tos., Groote Eylandt. Type male.  
8. *Paraoxypilus armatus* Giglio-Tos., Daly River, female.

**Plate xiii.**

- Fig. 9. *Paraoxypilus tasmaniensis* Sauss., Tasmania, male.  
10. *Paraoxypilus tasmaniensis* Sauss., Adelaide, female.  
11. *Paraoxypilus laticollis* sp. nov. Type male.  
12. *Paraoxypilus laticollis* sp. nov. Type female.  
13. *Paraoxypilus laticollis* sp. nov. Umberatana, female.  
14. *Paraoxypilus tasmaniensis* Sauss., Lillimur, male.  
15. *Clomantis dispar* sp. nov., Parachilna, male.

**Plate xiv.**

- Fig. 16. *Orthodera marginata* Sauss., Adelaide, male.  
17. *Orthodera marginata* Sauss., Mount Painter, female.  
18. *Orthodera ministralis* Fab., Roper River, female.  
19. *Orthodera ministralis* Fab., Adelaide, female.  
20. *Orthodera ministralis* Fab., left anterior leg, male.  
21. *Orthodera burmeisteri* Wood-Mason, Dalby, female.  
22. *Orthodera burmeisteri* Wood-Mason, right anterior leg, female.  
23. *Pseudomantis albofimbriata* Stal, Sydney, female.  
24. *Pseudomantis albofimbriata* Stal, right anterior leg, male.

**Plate xv.**

- Fig. 25. *Rhodomantis gracilis* sp. nov. Type male.  
26. *Rhodomantis pulchella* Tepper, Mount Painter, male.  
27. *Stenomantis n. biseriata* Westwood, Cairns, female.  
28. *Stenomantis n. biseriata* Westwood, Cairns, male.

**Plate xvi.**

- Fig. 29. *Archimantis monstrosa* Wood-Mason, Groote Eylandt, female.  
30. *Archimantis monstrosa* Wood-Mason, Roper River, female.

- 31. *Archimantis sobrina* Saussure, Cunnamulla, female.
- 32. *Archimantis latistyla* Serville, Adelaide, male.
- 33. *Archimantis armata* Wood-Mason, Cairns, male.

**Plate xvii.**

- Fig. 34. *Sphodropoda viridis* sp. nov. Mount Painter, male.
- 35. *Archimantis quinquelobata* Tepper. Type male.
- 36. *Archimantis quinquelobata* Tepper, Fraser Range, female.
- 37. *Archimantis quinquelobata* Tepper, right anterior leg, female.

**Plate xviii.**

- Fig. 38. *Archimantis monstrosa* Wood-Mason, Stapleton, male.
- 39. *Archimantis minor*, Giglio-Tos, Beverley, female.
- 40. *Archimantis brunneriana* Saussure. Type female.
- 41. *Nullabora flavoguttata* sp. nov. Type female.
- 42. *Sphodropoda loripes* sp. nov. Type female.
- 43. *Ngawala dentifrons* Stal, Yorke's Peninsula, male.
- 44. *Ngawala dentifrons* Stal, left anterior leg, female.
- 45. *Parhierodula pustulifera* Wood-Mason. Type male.
- 46. *Thorodia melanoptera* sp. nov. Murray River, female.

**Plate xix.**

- Fig. 47. *Archimantis latistyla* Serville, Adelaide, female.
- 48. *Sphodropoda tristis* Saussure, Mount Bryan, female.
- 49. *Ngawala dentifrons* Stal, Yeelana, female.

**Plate xx.**

- Fig. 50. *Parhierodula majuscula* sp. nov. Cairns, female.
- 51. *Parhierodula majuscula* sp. nov. Type female, reverse.

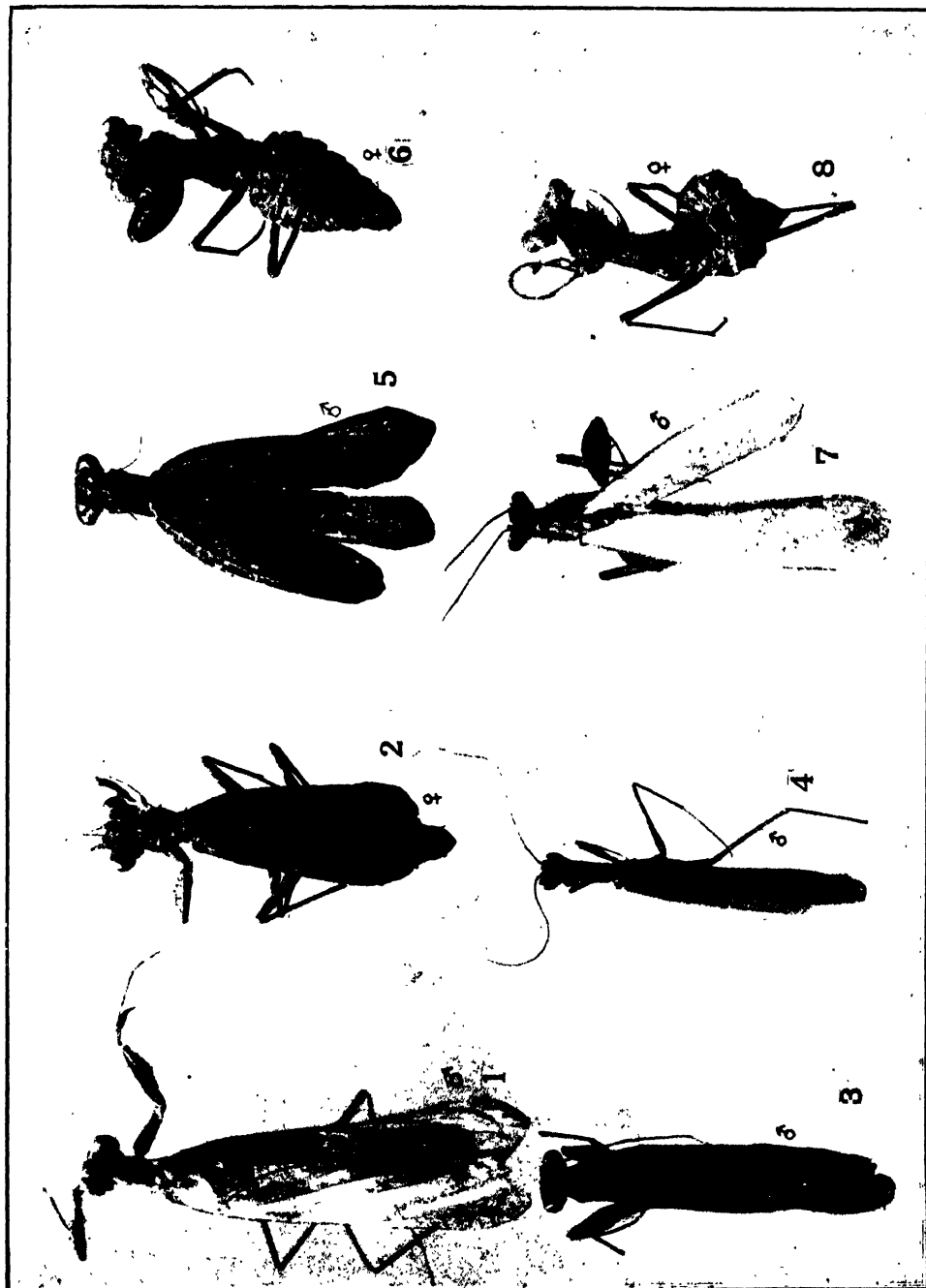
**Plate xxi.**

- Fig. 52. *Parhierodula pustulifera* Wood-Mason, Groote Eylandt, female.
- 53. *Parhierodula quinquedens* Macleay, Groote Eylandt, female.
- 54. *Tenodera intermedia* Saussure, Emerald, female.
- 55. *Tenodera australasiae* Leach, Adelaide, male.
- 56. *Austrovates variegata* Sjöstedt, Roper River, female.

**Plate xxii.**

- Fig. 57. *Notomantis chlorophana* gen. and sp. nov. Type male.
- 58. *Mantis octospilota* Westwood, Fortescue River, male.
- 59. *Thorodia melanoptera* gen. and sp. nov. Type male.
- 60. *Thorodia m. major* subsp. nov. Type female.

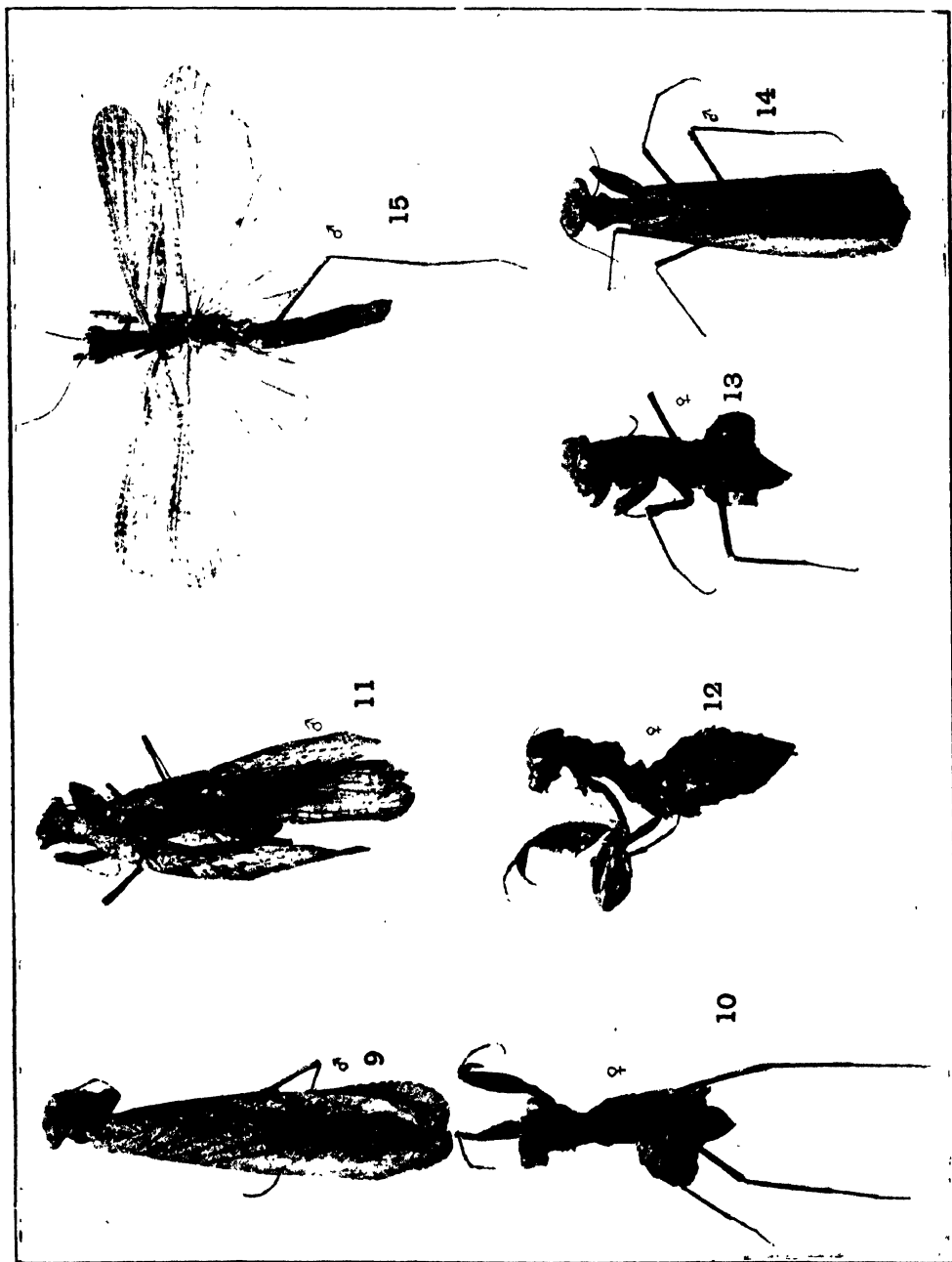




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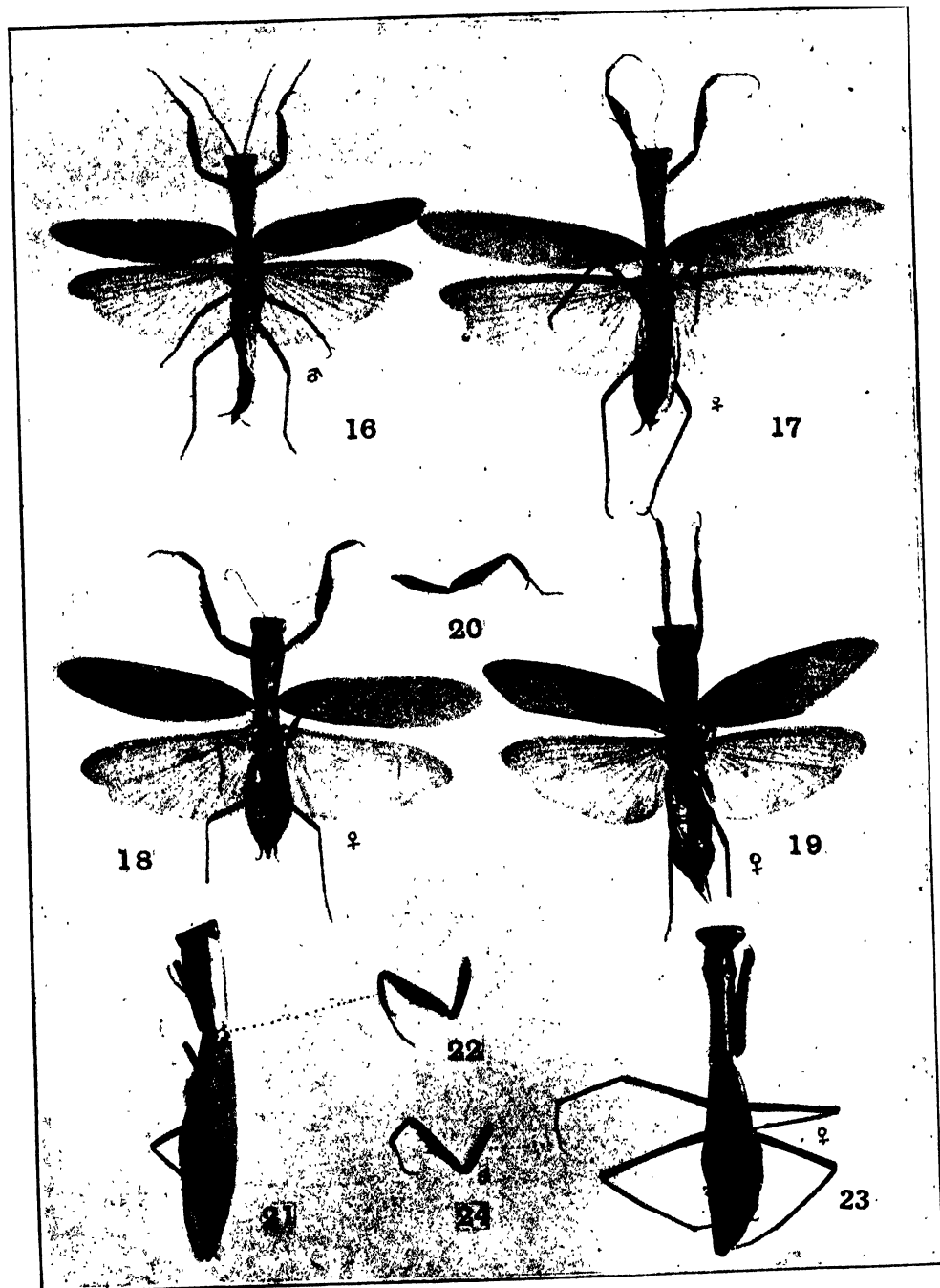






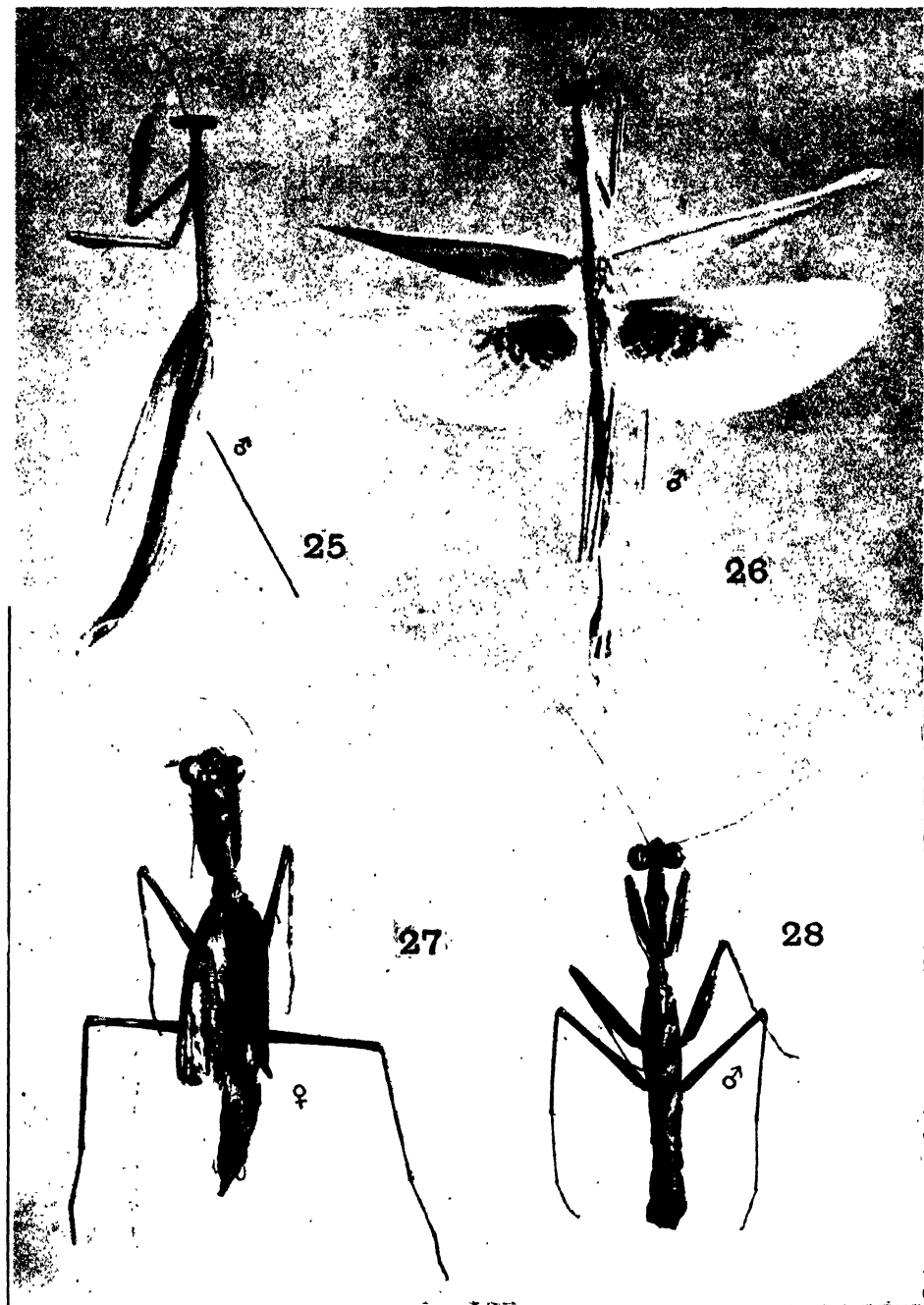
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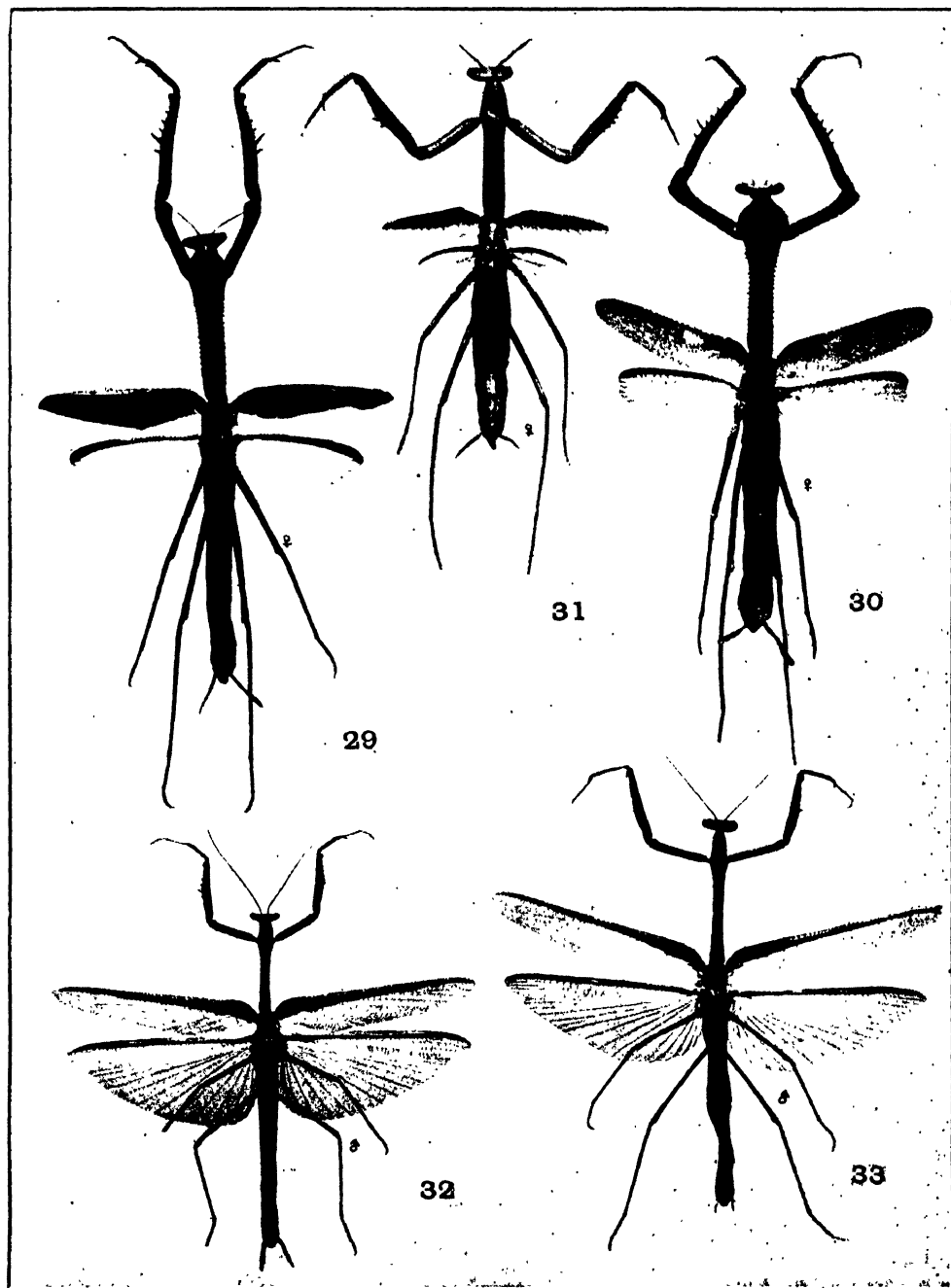
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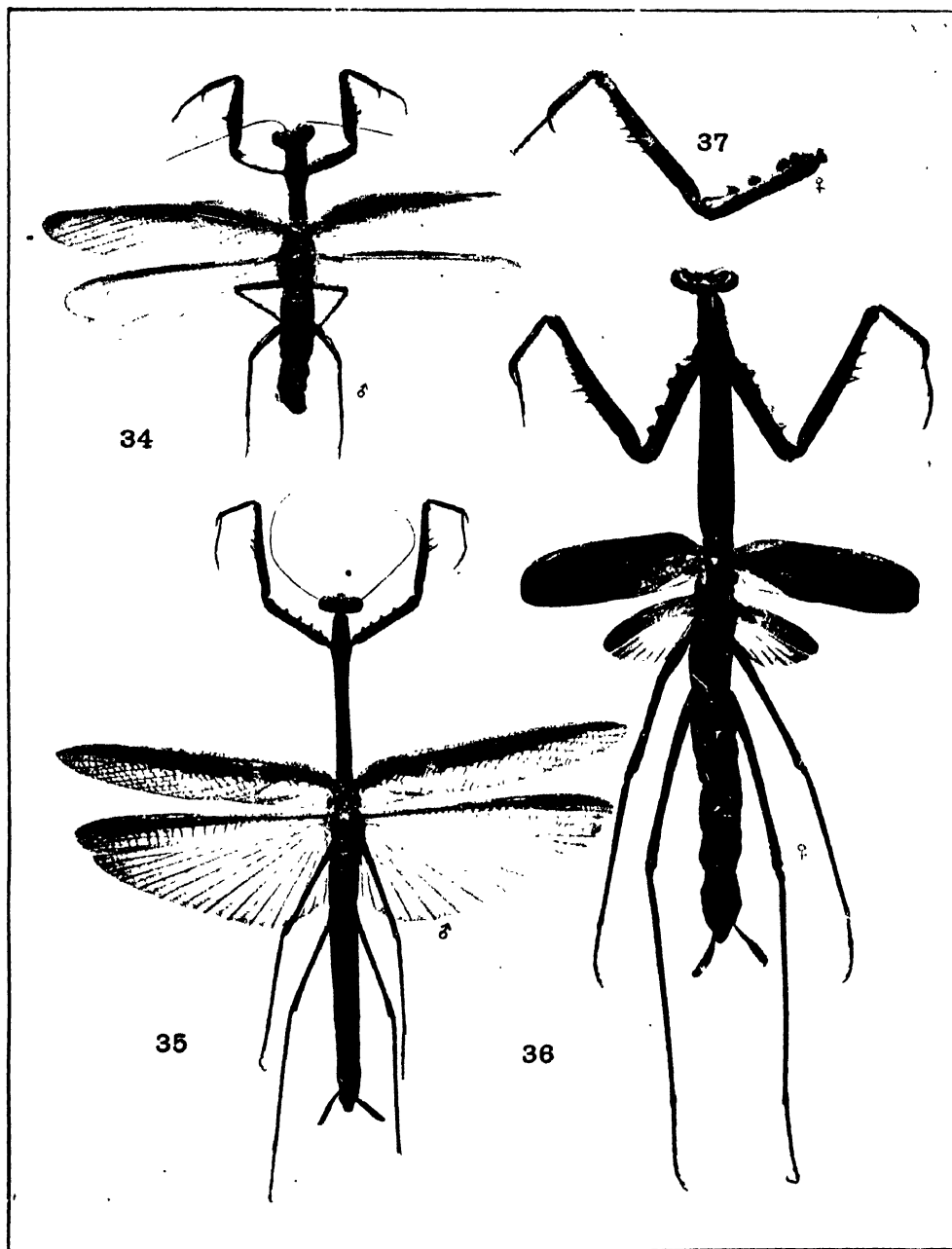




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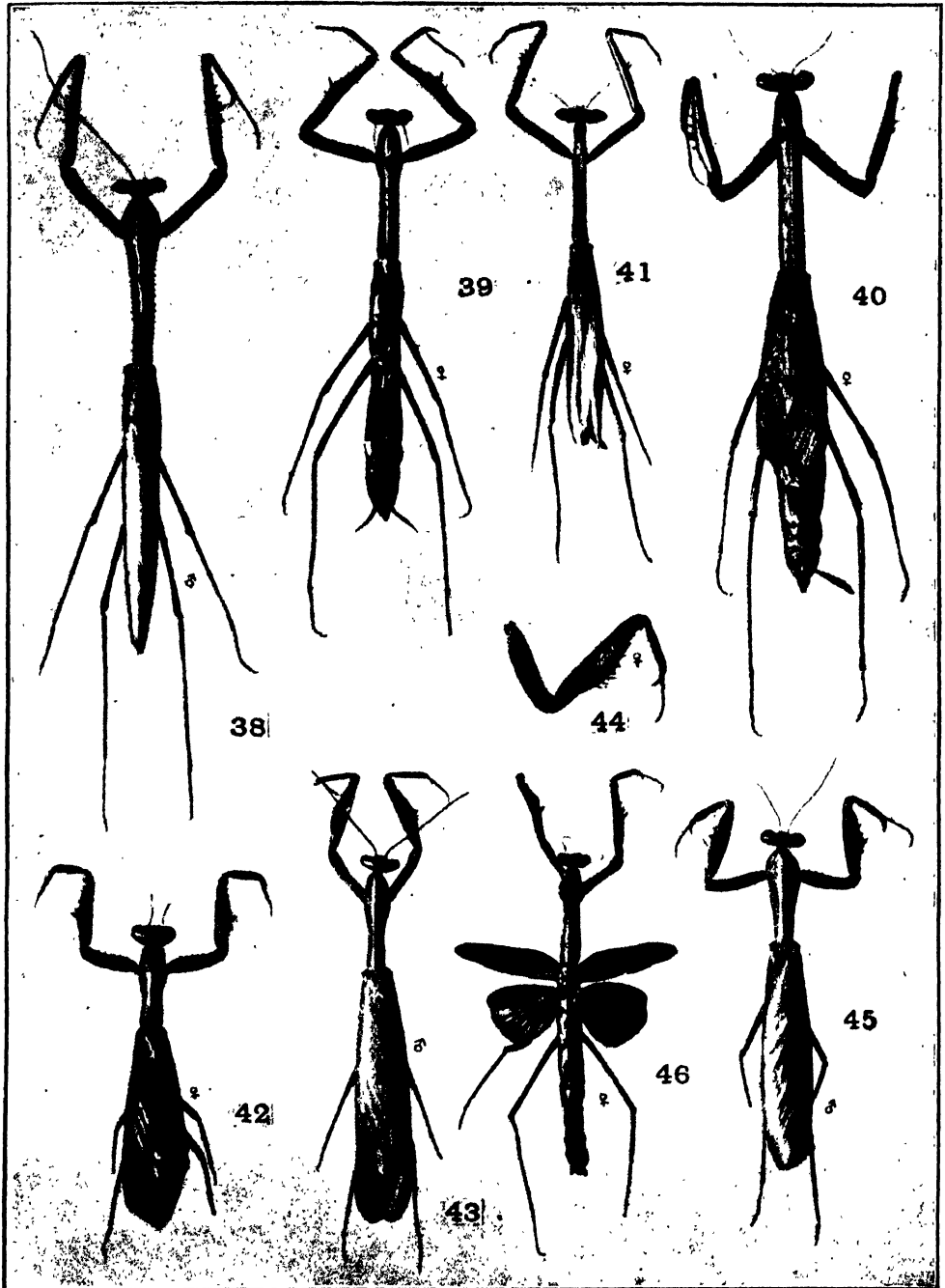






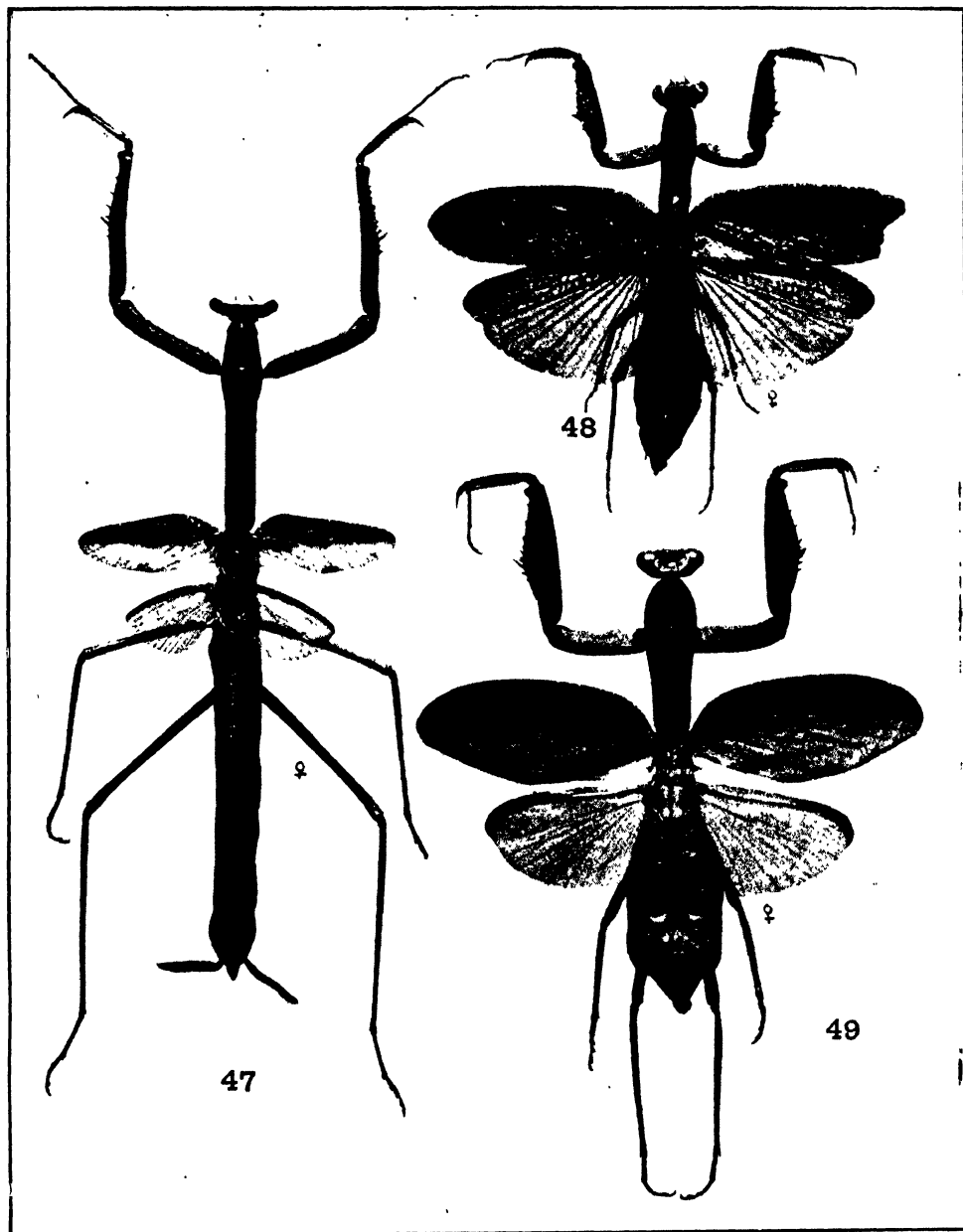
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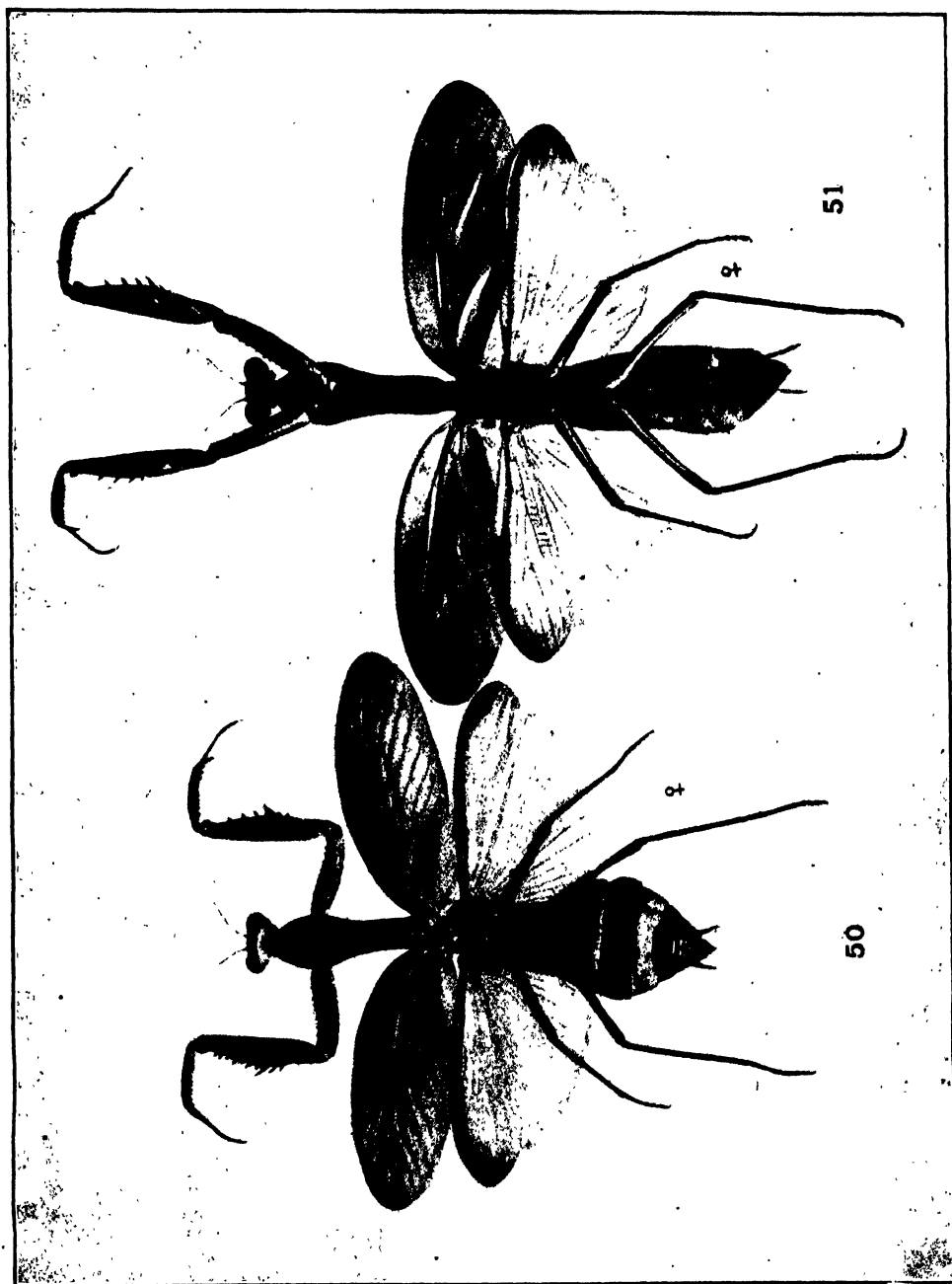
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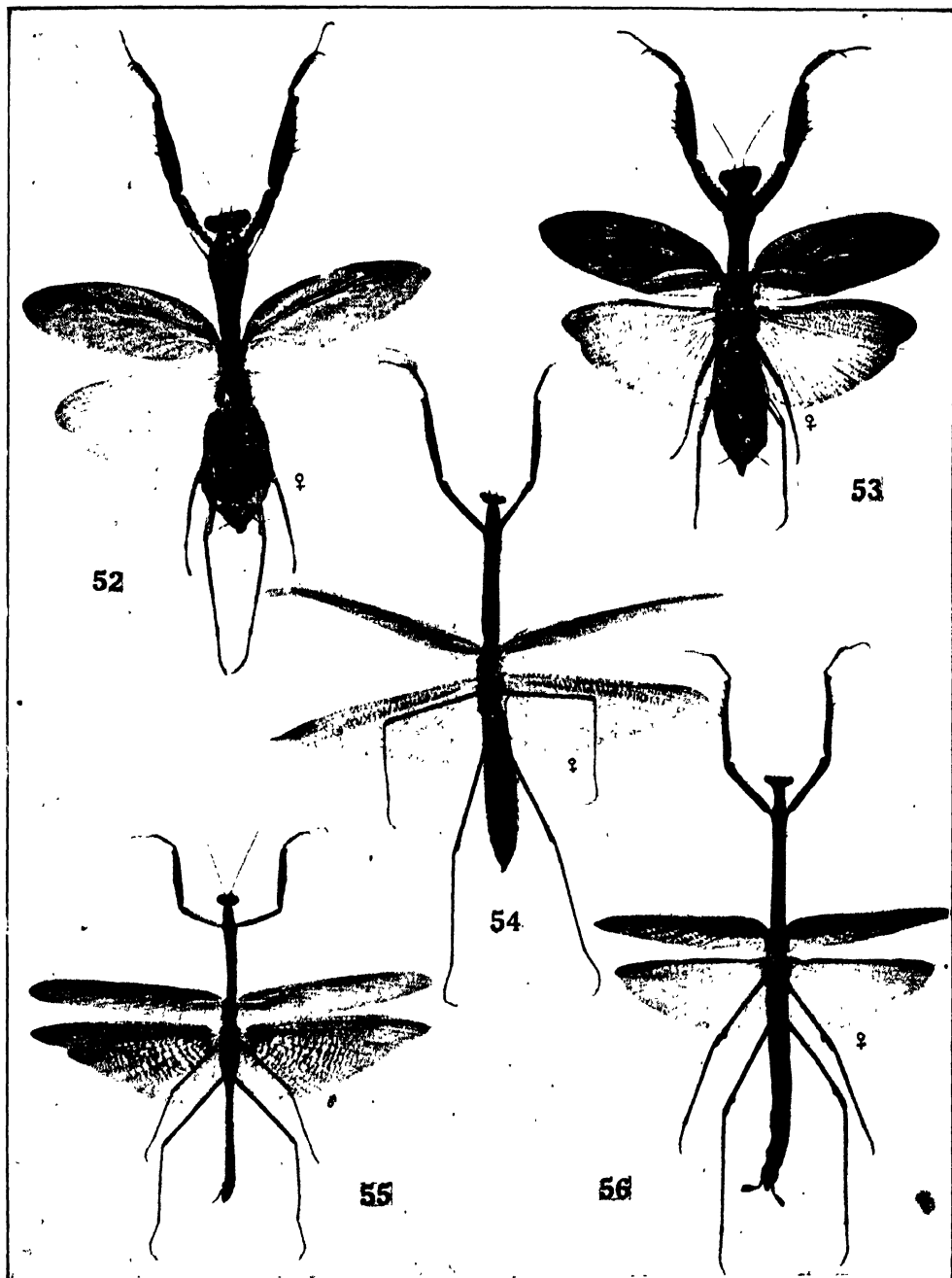




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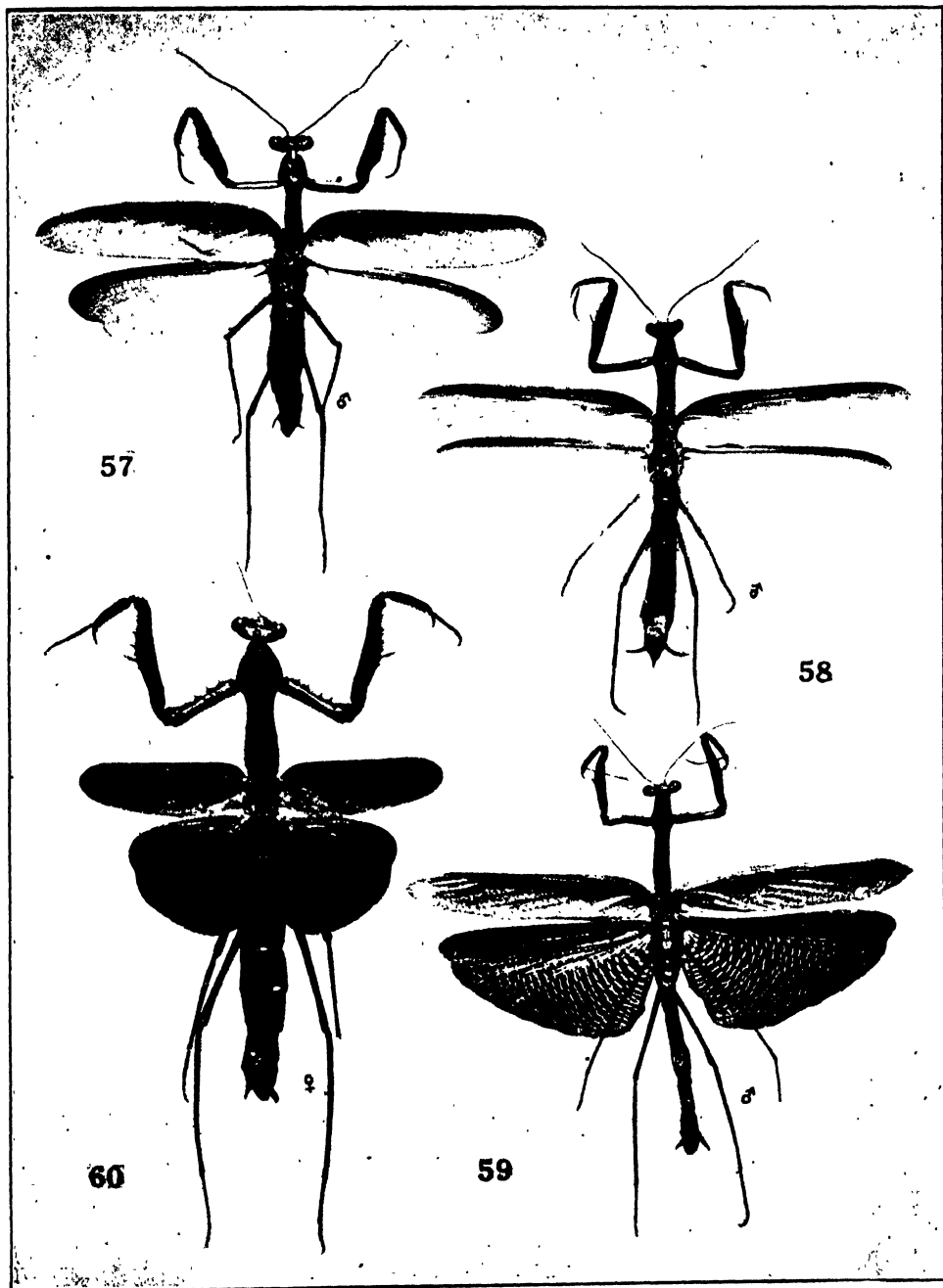






AUSTRALIAN PRAYING INSECTS.





AUSTRALIAN PRAYING INSECTS.



# SIX HITHERTO UNDESCRIBED SKULLS OF TASMANIAN NATIVES.

By F. WOOD-JONES, D.Sc., HON. CURATOR IN ANTHROPOLOGY.

## WITH AN ACCOUNT OF THE PALATE AND TEETH.

By T. D. CAMPBELL, D.D.Sc., HON. ASSISTANT CURATOR IN ANTHROPOLOGY.

Plates xxiii-xxv and text fig. 378.

DETAILS of the six skulls of Tasmanian natives described in this paper have not previously been made accessible to students of physical anthropology. Since the amount of available material is now so limited, it becomes a duty incumbent upon all those having specimens in their charge to publish such accounts as may enable students, the world over, to utilize the data that may be gleaned from their examination. The present writers, in compiling a record of the few skulls available to them, wish to add this record to the series by which Professor Richard Berry has laid anthropologists under a debt. Since dioptrographic tracings, in three normal, are given of each skull that is sufficiently complete for examination, no elaborate description is added. Such characters as the contours of the cranial vault and the facial portion of the skulls are so readily appreciated from the tracings that it is superfluous to describe them. Only the more inconspicuous details, which are not evident in the tracings, are mentioned. Two of the skulls, Nos. 576 and 577, and the mandible 707, are in the Museum collection; the other four being in the possession of Dr. Robert Pulleine, of Adelaide. The measurements advocated by the international agreement (1906) have been adopted for all cranial and facial details. Throughout the whole series of measurements, \* indicates the nearest approximation possible, in material which has suffered damage and weathering. The descriptions and measurements of the palate and teeth are the work of Dr. T. D. Campbell.

Measurements of the teeth are as given in Black's "Dental Anatomy." The following are the points used in the palate measurements:

*Pr. Prosthion.* Most anterior point.

*Or. Orale.* Median point on line tangent to lingual margins of central incisors.

*For.* Median point on posterior margin of the incisive canal.

*Sut.* Point where median and palato-maxillary sutures cross; if transverse sutures do not meet, the point midway between them.

*Al. Alveolon.* Median point on a line touching extremities of post-dental alveolar processes.

*Sta. Staphylion.* Median point on a line tangent to base of large notches on posterior border of palate.

*Sp.* Extremity of posterior nasal spine.

*X.X.* External width taken just above second molars.

*Y.Y.* Internal width between margins of second molar sockets.

*P.P.* Internal width between margins of second premolar sockets.

*C.C.* Internal width between margins of canine sockets.

*Depth.* Vertical depth from line touching inner margins of second molars.

*P.D.A.P.* Length of post-dental alveolar process measured from the posterior margin of third molar socket to free end of tuberosity.

Palatal index is here derived from maximum diameters of the palate; i.e., *Pr.-Al.* and *X.X.*

### SPECIMEN 576.

From the "Eastern part of Tasmania." Purchased from Mrs. E. G. Atkinson, May 17, 1912. In the possession of the Museum. A slightly eroded and freely root marked skull, lacking the mandible. All sutures open without, commencing closure within. Sutures simple. Small bilateral ossicles,  $15 \times 8$  mm., present at the lower angles of the lambdoid suture. The parietal foramen present on the left side. The alisphenoid meets the right parietal over an area of 8 mm.; a fused epipteric bone doubtfully present on the right. Shallow supraorbital notches on both sides. The nasal bones narrow and synostosed in their upper portions. The spheno-maxillary fissures wide. Infraorbital foramen single on both sides. Narial margins double below, but the anterior margin only defined to within 10 mm. of the mid line. Nasal spine present. Subnasal prognathism only moderate. Anterior surface of superior maxillae concave. Foramen ovale small,  $4 \times 3$  mm., complete. Foramen spinosum complete. Styloid processes small, not projecting beyond the free border of the vaginal processes, which are only moderately developed. Glenoid fossae fairly deep. Mastoid processes small and rounded. Foramen magnum small, symmetrical. Posterior condyloid foramen present on the left side.

**Dentition.** Only the three upper right molar teeth are present; sockets for the remaining teeth indicate losses after death.

**Attrition.** Only  $M^1$  affected; Stage I (Broca).

Measurements.	Crown.		Total length.
	M.D.	L.L.	
$M^1$	11	13	24
$M^2$	11.5	13.5	—
$M^3$	9.5	13	24

**Roots.** Median incisors single rooted, and the alveoli are shallow, as if teeth were undergoing exfoliation. Lateral incisors and canines, single rooted; 1st premolar, two rooted; 2nd premolars, double rooted only in upper third of their root length; 1st molars, three rooted, with roots very divergent; 2nd molars, three rooted; 3rd molars, three rooted and on right side, ant. buccal and palatal roots joined by a thin plate, on left side more or less complete fusion of roots.

No sign of caries or pathological destruction of alveolar process either in cervical or root portions of teeth. No calcic deposits on teeth. Occlusal pattern of molars is very crenated.

### SPECIMEN 577.

Data as for No. 576. Skull lacking the mandible, showing no erosion or root marking. In many places the bone is marked by incisions, which were apparently made by a sharp instrument when the bone was fresh. In addition to these cuts on the bone, there are, around the margins of the foramen magnum and upon the left malar-frontal junction, marks where the bone has been scraped away by a rasping instrument or gnawed by the teeth of a rodent. All sutures open without, closing within. No sutural inclusions or irregularities. Parietal foramen absent. At the pterion the alisphenoid meets the parietal over an area of 5 mm. on both sides. Shallow supraorbital notches present on both sides: on the right side there is, in addition, a foramen of Henle. The upper extremity of the right nasal bone is larger than that of the left. The sphenomaxillary fissures are narrow. Infraorbital foramen single on both sides. Nasal margins infantile, approaching simian. Subnasal prognathism well marked. Foramen ovale  $5 \times 3$  mm., complete; the foramen of Vesalius is present on both sides. Foramen spinosum complete. Styloid processes absent. The vaginal process small. Glenoid fossa fairly deep. Mastoid process small and rounded. Posterior condyloid foramina present on both sides.

**Dentition.** In the upper jaw only the two first molars remain *in situ*; sockets for the remaining teeth indicate their loss after death.

**Attrition.** Stage II.

**Measurements.** Crown of left 1st molar, M.D. 12.

**Roots.** As indicated by teeth present and empty alveoli, central and lateral incisors and canines, single rooted: 1st premolars, single rooted, but bifurcated in apical portion; 2nd premolars, single rooted; 1st and 2nd molars, three rooted; 3rd molars, three rooted, with buccal roots joined and ant. buccal and palatal roots connected by a thin plate,



No sign of caries, or any obvious loss of alveolar process through periodontal lesions or alveolar abscess. No calculus.

### SPECIMEN P.1.

From sand drifts, Mount Cameron West. Considerably damaged; cranial and facial portions of a skull lacking the mandible. Much eroded, but greatly hardened. Sagittal suture entirely obliterated, except at its hinder end, coronal widely patent. Lambdoid suture open both within and without. Bilateral small ossicles, 20 mm. in diameter, present at the lower angles of the lambdoid suture. Parietal foramen absent: a large foramen present 14 mm. to the left of the mid line, and the same distance behind the coronary suture. This foramen communicates with a deep middle meningeal venous groove, which continues to the base of the skull as Brechet's sinus. The right alisphenoid meets the parietal over an area of only 3.5 mm. On the left side the bones are lacking. Shallow supraorbital notches present on both sides. The right (only remaining) infraorbital foramen is single. The glenoid cavity is deep. External auditory meatus narrow in its antero-posterior diameter. Vaginal processes of the temporal well developed; styloid process absent. Foramen ovale round, 5 mm. in diameter, complete; foramen of Vesalius present. Foramen spinosum incomplete.

**Dentition.** Teeth present are the upper right premolars and the 2nd and 3rd molars. Sockets for canine, lateral incisor, and 1st molar show these teeth to have been lost after death. The left maxilla has been broken away.

Attrition. Stage III.

Measurements.	Right.	M.D.	L.L.
(Crown only.)	Pm <sup>1</sup>	7.5	10.5
	Pm <sup>2</sup>	7.5	—
	M <sup>1</sup>	11	—
	M <sup>2</sup>	11	13.5
	M <sup>3</sup>	10.5	13

**Roots.** The two premolars are double rooted, and the three molars each possess three distinct roots without any tendency to fusion.

No caries or loss of alveolar process through periodontal lesions or chronic alveolar abscess. No sign of calcic deposits.

### SPECIMEN P.2.

The original data with the skull as follows: "Found together with the bones of the skeleton in 1919, in a sand drift at Bluff Point, West Coast, Tasmania, by W. Wilson, of Montagu, who was searching for cattle. He did not collect the bones of the skeleton, taking only the cranium, in which, he told me, the teeth

were complete. In carrying the skull home the incisors and canine fell out. He did not see or search for the lower jaw bone." Later the skull was purchased, and the purchaser visited the site of the find and discovered the remains of a native camp, with some twelve shelters. It is doubtful if the other bones found near the skull were human. The skull was later acquired by Dr. Pulleine. A fine, massive, heavy skull; not eroded, but very freely root marked; hardened and bleached. Mandible not present. All sutures of the vault are closed within and without, and most are almost obliterated. All the sutures are simple, and no signs of sutural ossicles can be detected. The parietal foramen is present on both sides. At the pterion the alisphenoid meets the parietal over an interval of only 5 mm. on both sides, the contact being made without the intervention of an epipteric bone. Supraorbital depressions (hardly to be termed notches) present on both sides. The nasal bones extremely narrow and synostosed in the middle line. The infraorbital foramen single on the right; double on the left, the small accessory foramen being to the middle line of and above the normal foramen. The suture of the main foramen turns out from the malar-maxillary suture on both sides. The anterior surface of the maxillae not retracted. Sphenomaxillary fissures very narrow. The anterior ethmoid canal passes through the junction of the frontal and ethmoid, its circumference being derived equally from both bones. Nasal margins double, infantile; a well-marked nasal spine is present. Subnasal prognathism well marked. Foramen ovale small and round, with a diameter of 4 mm.; the foramina are complete. A foramen of Vesalius is present on both sides. Foramen spinosum only partially complete. The styloid processes are present as two slender pieces of bone 7 mm. in length. Glenoid fossae only moderately deep. Vaginal processes of temporal thick and strong. Mastoid processes small. Foramen magnum symmetrical: a well-marked manifestation of an occipital vertebra is present. The posterior condyloid foramen is present on both sides.

**Dentition.** The teeth present are all the molars and premolars; the root portion only of the right canine remains in its socket, while the remaining sockets show the loss of teeth after death.

**Attrition.** Stage II.

Measurements. Crowns only.

		Pm <sup>1</sup>	Pm <sup>2</sup>	M <sup>1</sup>	M <sup>2</sup>	M <sup>3</sup>
Right	M.D.	9	8	11.5	11.5	11
	L.L.	12	11.5	13	14	13
Left	M.D.	9	8	11.5	11.5	11
	L.L.	12	11.5	13.5	14.5	14
Arch widths at		Pm <sup>1</sup>	Pm <sup>2</sup>	M <sup>1</sup>	M <sup>2</sup>	M <sup>3</sup>
(external)		56	60.5	68.5	73	71

**Roots.** The 1st premolars are double rooted; 2nd premolars, irremovable from sockets; all the anterior teeth are single rooted; all the molars have three quite distinct roots in each case.

There are no signs of caries or alveolar abscess. The alveolar process seems to have undergone slight absorption around the necks of the teeth. The curve of the occlusal attritional plane on the molars is a compound one, similar to that well shown in the Australian dentition. No calcic deposits on teeth.

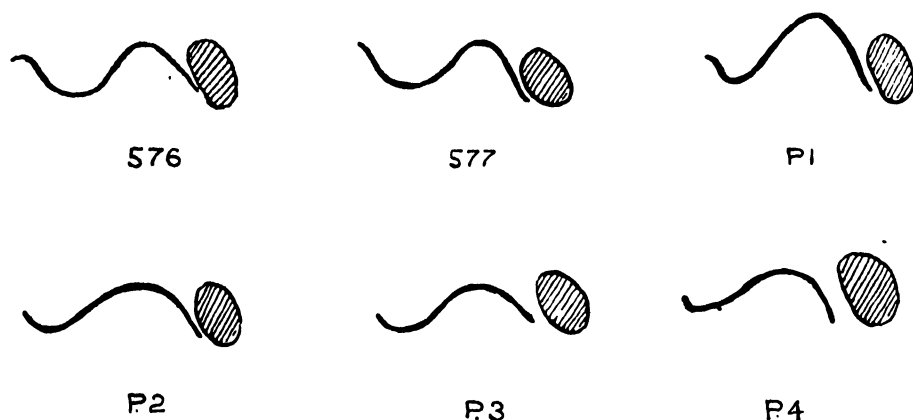


Fig. 378. Sagittal sections of the left glenoid fossa in the six skulls. In the case of P.1. the contour is that of the right side reversed.

### SPECIMEN P.3.

The original data with the skull as follows: "This cranium was found on the sand blow at West Point, West Coast, Tasmania, on February 13, 1922. It had rolled ten or twelve yards from the spot where the mandible and portions of the limb bones were found. In the vicinity two other mandibles were found and a portion of another cranium (this is P.4.). The spot on which I found the above was the site of a camp, and shell heaps (*Haliotis*) covered acres of the ground. Stone flakes were very numerous, as were hammer stones of various sizes." The skull passed from the finder into the possession of Dr. Pulleine. A considerably eroded and weathered, but hardened and bleached, skull, with an imperfect mandible. The skull is small and lightly built, and has every indication of being that of a female. The sutures are open without, closing within: the closure having proceeded to obliteration of the coronal and the extremities of the sagittal. The sutures simple, save that at the lambda are two middle line ossicles, the small anterior one being roughly circular with a diameter of 10 mm., the larger posterior one being 38 mm. broad and 13 mm. in antero-posterior

measurement. At the right asterion is a depressed area,  $45 \times 25$  mm., of a well-healed depressed fracture. The depression is smooth without, but within a considerable spur of bone, 30 mm. in length, projects into the cranial cavity for a distance of from 12 to 15 mm. The parietal foramen is present only upon the right side. At the pterion the alisphenoid meets parietal over an interval of only 5 mm.; on the right side the contact is effected by the higher of two scale-like epipteric bones. Shallow supraorbital notches bilateral. The frontal extremity of the right nasal bone is far larger than the corresponding area of the left bone. The infraorbital foramen is single on both sides; its suture is medial to, and wholly independent, of the malar-maxillary suture. The anterior surface of the maxillae markedly concave. Sphenomaxillary fissures fairly wide. The anterior ethmoid canal passes through the junction of the frontal and the ethmoid, more of its diameter being in the frontal than in the ethmoid. Nasal margins double, infantile. Subnasal prognathism well marked. Foramen ovale small,  $5 \times 3$  mm., incomplete posteriorly on both sides. Foramen spinosum incomplete. The styloid processes are absent, save for a small nipple of bone on the left. Glenoid fossae moderately deep and evenly curved. Vaginal processes of temporal thick and strong. External auditory meatus narrow in its antero-posterior axis; with anterior and posterior exostoses on both sides. These exostoses almost block the meatus, the most external exostosis being upon the posterior wall on both sides of the skull. Mastoid processes very small. Foramen magnum small and symmetrical. A posterior condyloid foramen was probably present on the right side.

**Dentition.** In the upper jaw only the molars remain *in situ*; the other teeth have been lost after death. In the mandible all the molars remain, and also the premolars on the right side; the other teeth have been lost after death.

**Attrition.** Stage II.

**Measurements.** In most instances the enamel has been broken away to such an extent that crown measurements are impossible; the following are recordable.

	M.D.	L.L.		
Right upper M <sup>1</sup>	—	13		
Right upper M <sup>2</sup>	—	13		
Right upper M <sup>3</sup>	—	13		
Right lower Pm <sup>1</sup>	8	9		
Right lower M <sup>2</sup>	12	11.5		
Right lower M <sup>3</sup>	13	11.5		
Arch widths (ext.) at		M <sup>1</sup>	M <sup>2</sup>	M <sup>3</sup>
Upper	65	69	—	
Lower	—	63	68	

**Roots.** All the upper and lower anterior teeth were single rooted; upper 1st Pms., two rooted; upper 2nd Pms., single rooted, but bifurcated in apical portion; all upper molars, three separate roots; both lower 1st Pms. show a tendency towards two-root formation; lower 2nd Pms. single rooted; all lower molars, two distinct roots.

No indication of caries or alveolar abscess absorption. Slight periodontal alveolar process absorption. Curve of occlusal attritional plane on molars is compound. No sign of calcic deposits on the teeth.

The mandible presents no mandibular torus.

### **SPECIMEN P.4.**

Original data as for P.3.

An extremely eroded, but well-hardened skull, lacking the facial portion. All sutures, including the metopic, open both within and without. Sutures fairly simple. A small ossicle in the sagittal suture 10 mm. anterior to the lambda, and a larger ossicle  $44 \times 22$  mm. in the right lambdoid. Parietal foramen present only on the left side. At the pterion the alisphenoid meets the parietal over an area of only 5 mm., the contact being effected without the intervention of an epipteric bone. Supraorbital depressions (hardly to be termed notches) present on both sides. Foramen ovale,  $5 \times 3$  mm.; complete posteriorly. Foramen spinosum complete. Foramen magnum oval, symmetrical. Styloid processes absent. Glenoid cavities shallow. Vaginal process of the temporal only moderately developed. Mastoid process small. Posterior condyloid foramen present on both sides. Maxillae and mandible absent.

### **SPECIMEN 707.**

Mandible only received by the Museum, with skulls 576 and 577, but belonging to neither skull. Teeth present are the 1st and 2nd molars on both sides. The crowns of two of these teeth are badly broken. In the right premolars only the root portions remain. The sockets of the 3rd molars, left premolars, right canine and lateral incisor are all empty, while the sockets of the two central incisors and left lateral incisor have undergone almost complete absorption.

Attrition. Stage III on M<sup>1</sup>.

Measurements. Crown only.

Right M<sup>2</sup>      M.D. 12;      L.L. 12.

Left M<sup>1</sup>      M.D. 11.5.      L.L. 12.

**Roots.** Premolars, single rooted; 1st and 2nd molars, two rooted; right second molar has an extra root on buccal side, but all are more or less fused together; 3rd molars, roots fused.

No signs of caries or alveolar abscess; distal surfaces of the two 1st molars present shallow erosion cavities.

No sign of a mandibular torus.

### Cranial Measurements.

	576.	577.	P.1.	P.2.	P.3.	P.4.
1. Maximum length . . . . .	180	177	191	202	181	186
2. Antero-posterior iniae length	176	177	191	202	176	185
3. Greatest cranial width . . .	142	127	137	142	132	135
4. Cranial height:						
(a) Basilo-bregmatic . . .	132	127	—	135	127	132
(b) Auriculo-bregmatic . .	116	105	113	114	110	114
5. Minimum frontal . . . . .	92	94	93*	94	89	—
6. Maximum frontal . . . . .	112	104	106	108	103	110
7. Bi-mastoid diameter . . . . .	127	120	—	131	118	127
8. Bizygomatic . . . . .	135*	120	—	140	130*	140*
9. Naso-basilar . . . . .	97	102	—	102	96	100*
10. Alveolo-basilar . . . . .	95	105	—	112	103	—
11. Naso-mental . . . . .	—	—	—	—	114	—
12. Naso-alveolar . . . . .	69	62	68*	74	70	—
13. Nasal height . . . . .	51	46	52*	53	52	—
14. Nasal width . . . . .	26	25	—	27	28	—
15. Interorbital width . . . . .	20	22	23*	23.5	22	—
16. Orbital width, L-R . . . . .	39-39	41-41	—40	41-42	39-40	—
17. Orbital height, L-R . . . . .	33-34	30-31	—34	32-30	34-34	—
18. Superior alveolar border . .	62*	62	—	70	67	—
19. Orbito-alveolar height . . .	42	36	42	46	47	—
20. Foramen magnum length . .	32	—	—	40	34	40
Foramen magnum width . .	27	31*	—	31	30	29
21. Sagittal curve:						
Frontal . . . . .	145	133	138	135	130	121
Parietal . . . . .	115	112	135	135	130	131
Occipital . . . . .	113	108	112	130	112	113
Total . . . . .	373	353*	385*	400	372	365
22. Transverse curve . . . . .	302	282	—	307	292	309
23. Horizontal curve . . . . .	524	500	530	560	515	525
24. Cubic capacity . . . . .	1295	1150	—	1320	1110	1100

**Mandibular Measurements.**

	576.	577.	P.1.	P.2.	P.3.	P.4.	707.
25. Bicondylar width . . . . .	—	—	—	—	—	—	—
26. Bigonal width . . . . .	—	—	—	—	90	—	98*
27. Length of ramus . . . . .	—	—	—	—	127	—	—
28. Width of ramus, maximum ..	—	—	—	—	43	—	—
minimum ..	—	—	—	—	32	—	—
29. Symphysial height . . . . .	—	—	—	—	32	—	28
30. Height of body . . . . .	—	—	—	—	27	—	—
31. Maximum thickness . . . . .	—	—	—	—	14	—	18

**Palate Measurements.**

<i>Palate Length.</i>	576.	577.	P.2.	P.3.
(Max.) Pr.-Al. . . . .	58	59	66	63
Pr.-Sta. . . . .	54.5	55	66	60
Pr.-Sp. . . . .	57.5	59	71	65
Or.-Sta. . . . .	49	49.5	60	54
Sut.-Sta. . . . .	10.5	13	17	14
Sut.-For. . . . .	31	29	34.5	31
<i>Palate Width.</i>				
(Max.) X.X. . . . .	64	64	72	69
Y.Y. . . . .	38*	40.5	42.5	41
P.P. . . . .	33	38	38.5	38
C.C. . . . .	26	29	27	28
Palatal index . . . . .	110.3	108.5	109.1	109.5
Length post-dental alveolar process . . . . .	5*	7	10.5	12
Palatal depth opposite M.2...	13.5*	8	16	14

**General Notes on Palates.**

On specimen 577 there are present remnants of the premaxillary suture, but complete fusion of this suture has taken place in the other three specimens. Median and transverse sutures obvious in all palates.

On specimens 577, 576, and P.3. the torus maxillaris medianus is developed to a slight-medium degree; it is absent on P.2. Nos. 577, P.2, and P.3 show a medium development of the torus palatinus medianus, which is absent on 576.

Grooves for palatine vessels and descending palatine nerves are well marked on 576, 577, and P.2.

The incisive canal is rather small in 577 and 576 compared with the size typical of Australian palates; it is somewhat larger in P.3 and P.2 than in the other two specimens.

#### **Further Dental Notes.**

In none of the specimens are there any indications of supernumerary teeth or accessory dental masses. The carabellian tubercle is not present in any stage of development on any of the first molars, as far as can be observed.

Occurrence of caries. Total number of teeth, 32. Carious teeth, nil.

Dental Index. In specimen P.2, 49.5.

Occlusal surfaces of the molars in all the specimens are worn by attrition, but as far as can be observed all the upper molars present had four cusps.

#### **Explanation of Plate xxiii.**

Upper row. Specimen 576 in three *normae*.

Lower row. Specimen 577 in three *normae*.

#### **Explanation of Plate xxiv.**

Upper row. Specimen P.1 in three *normae*.

Lower row. Specimen P.2 in three *normae*.

#### **Explanation of Plate xxv.**

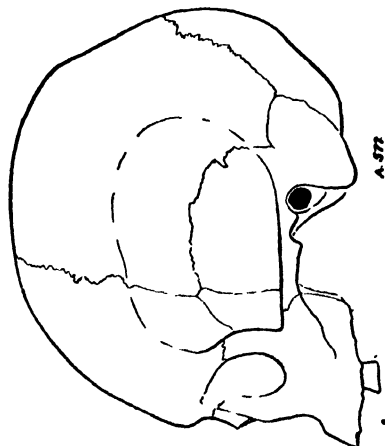
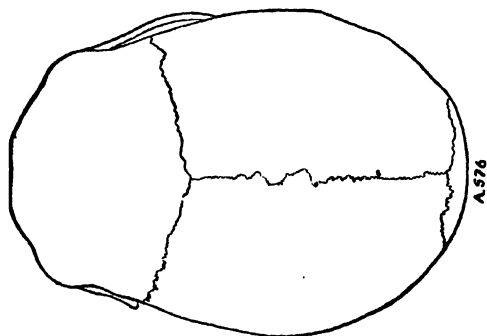
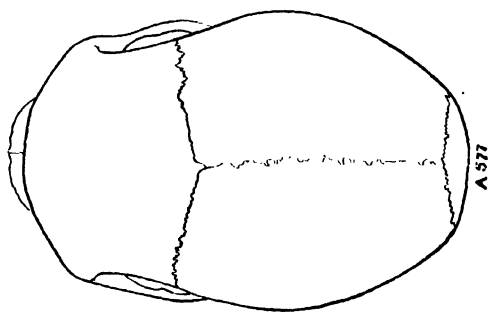
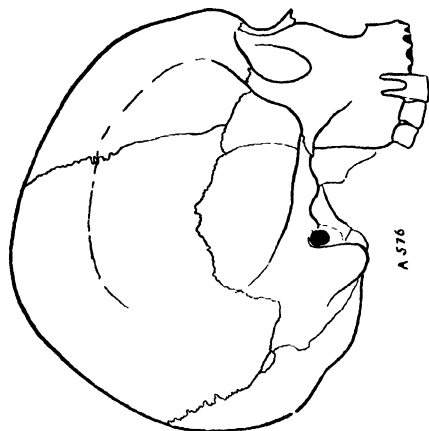
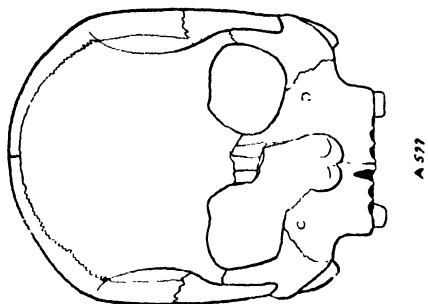
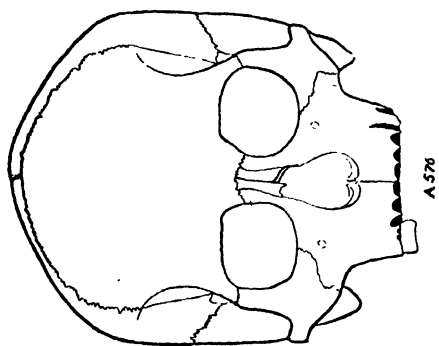
Upper row. Specimen P.3 in three *normae*.

Lower row. Mandible of P.3 and two *normae* of Specimen P.4.

All figures are one-third natural size.

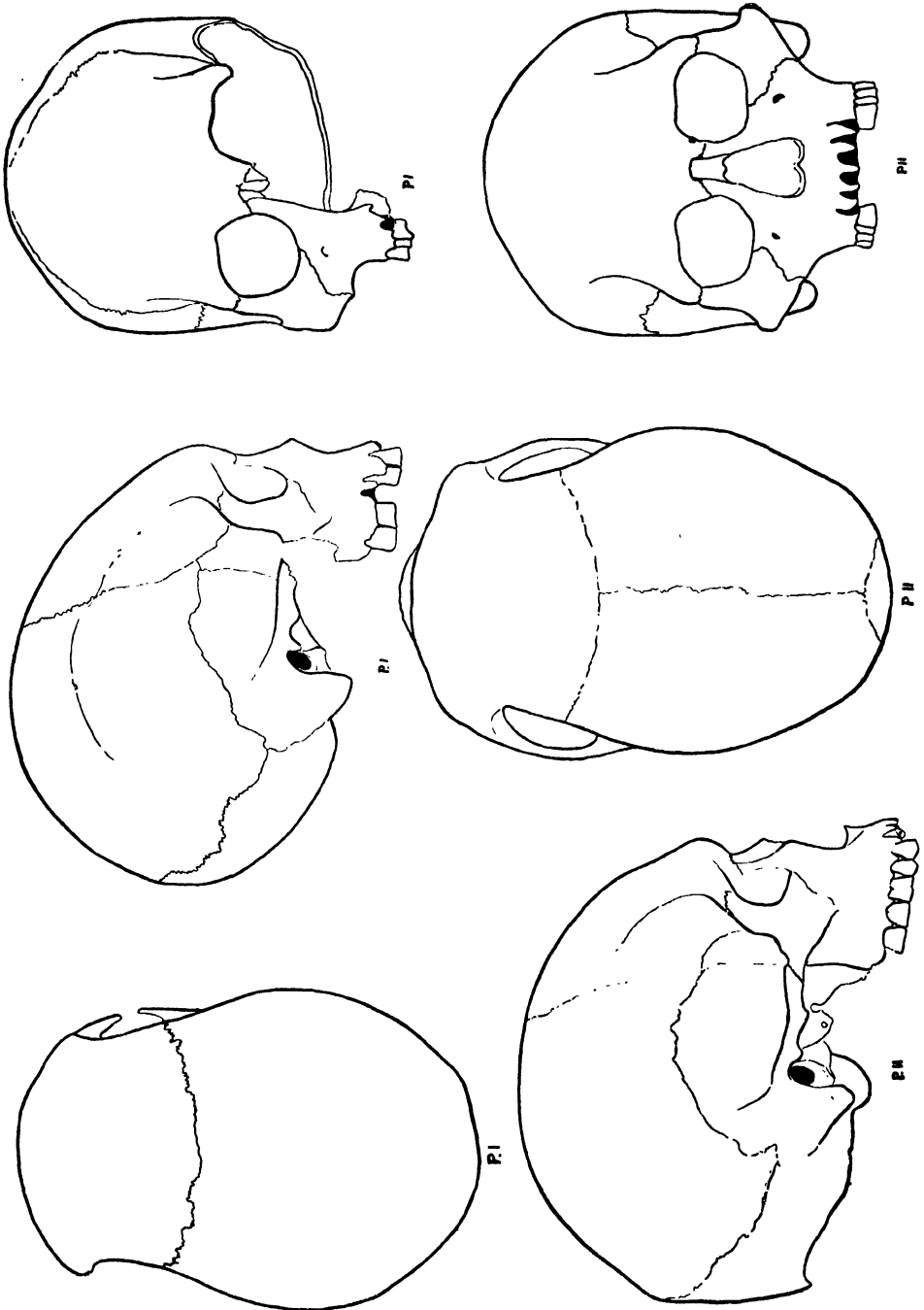






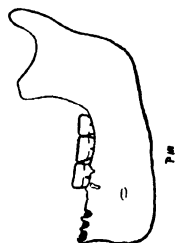
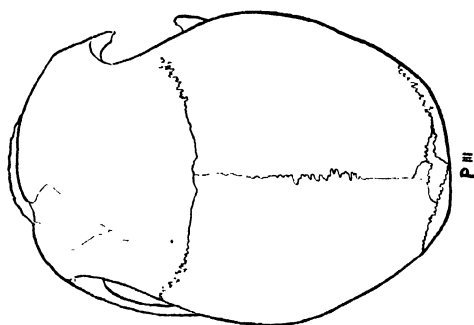
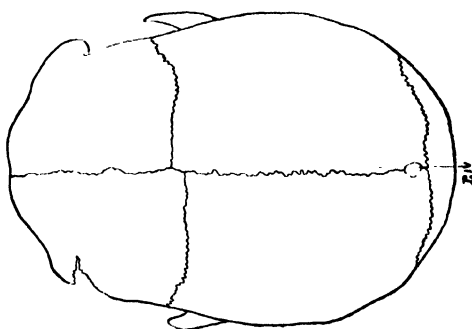
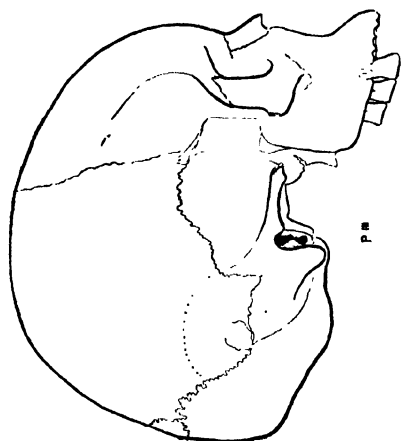
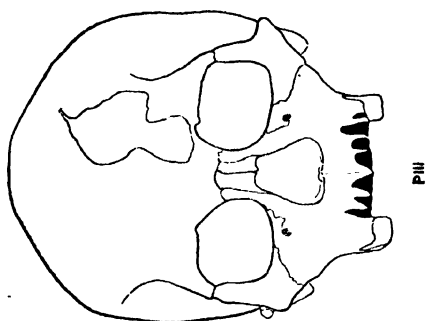
*DIOPTROGRAPHS OF TASMANIAN SKULLS.*





*DIOPTROGRAPHS OF TASMANIAN SKULLS.*





*F. Wood Jones del.*

DIOPTROGRAPHS OF TASMANIAN SKULLS.



## DUMMY MOURNING CAPS OF THE MURRAY RIVER NATIVES

By EDGAR R. WAITE, F.L.S., C.M.Z.S., DIRECTOR, SOUTH AUSTRALIAN MUSEUM.

Plates xxvi-xxviii.

Widows' caps, mourning caps, weeping caps or helmets, *korno* or *kopi*, as certain objects associated with death are variously termed, were at one time worn by bereaved wives of natives from parts of the River Murray system. The traditions and ceremonies connected therewith were maintained, possibly in degenerate form, until a few years ago.

As far as may be ascertained from published records and from information preserved in this Museum, the wearing of the caps was practised by the natives from Mannum to Blanchetown and Morgan at North-west Bend, to Chowilla, near the Victorian border; Lake Victoria and Moorna, in New South Wales, thence to Bourke. Dr. Anderson informs me that all the widows' caps in the Australian Museum were obtained on the Darling River or in its immediate vicinity, and from the following localities in New South Wales: Moorara; Cuthero; Murtee, and Mt. Murchison, both near Wilcannia; Lower Budda, near Mt. Macpherson; Killara, and from Yandilla, near Louth. Then we have the original record of Mitchell (1), who noted the lime casts on the graves at Bourke.

Widows' caps have long been known, but the significance of certain features, herein described, and which many examples from the Lower Murray exhibit, does not seem to have been previously noted.

The *kopi* balls mentioned by Matthews (21) were comparatively small objects, and they in nowise simulated widows' caps, as do those hereafter described.

A form of ceremonial cap has been previously described by Matthews (22), but it bears no resemblance to the objects herein dealt with. The cap specially described was not lined, was estimated to be 16 inches high, the depth of the cavity 14 inches, and the weight, when dry, 20 lb. An old native on the Darling "said the articles with the deep cavities were not worn on the head, but were laid upon the graves of old men and women of tribal importance." These "tributes of mourning" were used by men, who occasionally wore actual caps "in mourning for their mothers, mothers' sisters, their own elder sisters, their wives, and other blood relations of mature years."



The literature of widows' caps in English, and especially in Australian, publications is somewhat extensive, and has been ably collated by Etheridge, in the paper noted below (17). The method of quoting makes consultation rather tedious. For convenience of reference, therefore, the literature is here presented in chronological sequence, but references extraneous to the special subject are omitted. Those marked \* are additional to Etheridge's references.

1. Mitchell, *Three Exped. E. Aust.*, i, 1838, p. 252, figs.
2. Mitchell, *id.*, ii, p. 112.
3. Eyre, *Journ. Exped. Cent. Aust.*, ii, 1845, pl. i, p. 354.
4. Angas, *South Aust. Illus.*, 1846, pl. xxx, li.
5. Stanbridge, *Trans. Ethn. Soc.*, i, 1861, p. 298.
6. Krefft, *Trans. Phil. Soc. N.S. Wales*, 1866, p. 373.
- \* 7. Wood, *Nat. Hist. Man*, ii, 1870, p. 92.
8. Smyth, *Aboriginals of Viet.*, i, 1878, p. 111.
- \* 9. Lane Fox, *Journ. Anthropol. Inst.*, vii, 1878, p. 446.
10. Taplin, *Folklore, S. Aust. Aboriginals* (ser. i), 1879, pp. 27-30.
11. Bonney, *Journ. Anthropol. Inst.*, xiii, 1884, p. 135.
12. Curr, *Australian Race*, ii, 1886, p. 238 (Bulmer), 366 (Machattie and Little).
13. Bulmer, *Journ. Roy. Geogr. Soc. Aust. (Vict. Br.)*, v, 1888, pp. 22, 23.
- \*14. Edge-Partington, *Album of Natives of Pacific*, i, 1890, pl. cceliv, No. 6.
15. Hawdon, *Proc. Roy. Geogr. Soc. Aust. (N.S. Wales Br.)*, v, 1891, p. 36.
16. Worsnop, *Prehistoric Arts, etc., Aborigines of Aust.*, 1897, p. 62, *et seq.*, 71, pl. xxxiii, fig. 2.
- \*17. Etheridge, *P.L.S.*, N.S. Wales, xxiv, 1899, pp. 333-345, pl. (xxv) xxvi-(xxx) xxxi.
- \*18. Freeman, *Aust. Ass. Adv. Sci.*, ix, 1902, p. 539.
- \*19. Howitt, *Native Tribes, S.E. Aust.*, 1904, p. 452.
- \*20. Mathews, *Proc. Amer. Phil. Soc.*, xlviii, 1909, No. 192.
- \*21. Mathews, *Queensland Geogr. Journ.*, xxiv, 1909, pp. 66-68, figs.
- \*22. Mathews, *Aust. Ass. Adv. Sci.*, xiii, 1911, pp. 445-449, pl. xli.
- \*23. Spencer, *Guide Aust. Ethn. Coll.*, Nat. Mus. Melb. (ed. iii), 1922, p. 122, pl. xxiv, fig. 219.

For some of these references I am indebted to the Director of the Australian Museum, and for others to Dr. W. Ramsay Smith, of Adelaide.

A few extracts from some of the works and from information preserved in this Museum will serve to introduce the subject to those unacquainted with the customs detailed.

Eyre's short notice is as follows: "Among some of the Murray tribes, a mourning cap is worn by the women, made two or three inches thick of carbonate

of lime. It is moulded to the head when moist around a piece of net work; the weight is eight pounds and a half."

Some additional details are supplied by Angas; of fig. 15 he writes: "A Mourning Cap worn by the women about the N.W. Bend of the Murray, and towards the Darling. The head is shaven, enclosed in a net, and covered with a coating of pipe-clay nearly two inches thick, which, when dry, resembles a plaster cast." His description of fig. 20 reads: "A native woman diseased; her head, face, breasts, etc., are covered with pipe-clay and grease; and her arms anointed with yellow clay from the bed of a river. This custom is also resorted to in mourning." The South Australian Museum possesses the original drawings made for the work, and it is interesting to note that in the drawing of the widow the pendulous breasts are exposed, and whitened as described; one leg also is shown. The figure was evidently redrawn for publication, the breasts and limbs being covered by clothing.

The above account forms the subject of the Rev. J. G. Wood's article, which is illustrated by Angas himself, the figure on the left of the accompanying picture being a reversed reproduction of his published drawing. The illustrations of the "tumuli" as much resemble the real grave mounds as do the conventionalized nests of flamingoes, the actual nests of the birds.

Some of the other works will be cursorily referred to, but Worsnop's account is worth quoting, not only for the additional information supplied, but also for a statement in respect to the hair, which suggests a difficulty, not previously presented: "White pipe-clay is used universally as a sign of mourning. On the banks of the Murray River the female relatives plaster the head of the widow almost daily with this kind of clay for three months after the death of her mate, and in time the covering assumes, by these daily additions, the form of a round helmet. When the days of mourning are over this covering is removed by cutting the hair close to the head, when it comes off in one hard and compact mass; it is then placed on the grave, which has been sheltered from the weather by the erection of a kind of hut of boughs, so closely interwoven together as to be almost impervious to the weather. . . . I weighed four of these head coverings found on a grave opposite to Blanchetown, on the Murray, and found two of them drew the scale at a little over 12 lbs. (each); the others were 13 lbs. and 14 lbs. respectively."

A number of widows' caps is exhibited in this Museum, where they were arranged by my predecessor, Sir Edward Stirling. I had casually noted marked differences presented by individuals of the series, but it was not until recently that I was led to take more than a passing interest in the exhibit.

On receipt of a specimen forwarded to the Museum by Mr. H. S. Taylor, of Renmark, I examined the collection more carefully, and made inquiries, a course that resulted in the preparation of this contribution; the new matter offered relating to the fact that dummies, complementary to the real caps, were also made and placed on graves.

Taking into consideration the large population of German agriculturists supported by the River Murray area, it is possible that the customs here detailed may have been previously recorded in some foreign journal. Even so, seeing that the facts are not, or little, known here, small justification is needed for presentation in an Australian publication.

When the widow's period of mourning was over and the mourning cap placed on the grave, many other similar objects, which had been prepared in readiness, were also deposited on the mound. It has been suggested (22) that the number of these caps indicates the degree of respect in which the dear departed was held; a sentiment akin to that symbolized by the profusion of wreaths placed upon the grave of an European, or the number of bouquets handed to a favourite singer or actress. It may be, however, that the custom touched more nearly the subject of personal vanity. My colleague, Dr. A. M. Morgan, tells me that about the year 1886, when in the neighbourhood of Morgan, on the River Murray, he visited a native cemetery about five miles from the town. He there saw seven or eight old graves, and upon one, covered by a wurlie, were about twenty widows' caps. He had some conversation on the subject with Policetrooper Ewens<sup>(1)</sup>, of Blanchetown. Ewens was an old bushman, and probably knew as much about the local natives as anyone. He informed Dr. Morgan that nearly all the caps were dummies, and were made and placed on the grave to impress the visitor, the inference desired to be drawn being that the departed was a great man, who had a large number of lubras or wives. Dr. Morgan secured a number of the objects, but on getting wet in the bottom of a boat they fell to pieces.

There should, I think, be small difficulty in determining which of a certain number of caps are real and which are dummies; most examples are quite unmistakable.

The real caps (pl. xxvi, fig. 1, 2) are of oval shape, with a deep depression below, fitting the head of the wearer, and frequently lined. The lining material, originally a net, but in the period of the white man often degenerated to a piece of sacking, calico, or other European material, is placed on the head, usually after shaving and prior to the first layer of pipé-clay, so as to afford some measure of protection to the scalp. *Some of the successive layers of clay may be traced in the real caps.*

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(1) *Vide* Taplin (10).

The dummies (pl. xxvii, fig. 3, 4), on the other hand, are roughly circular in shape and each was produced at a single operation, so that there is no indication of the layering, characteristic of the genuine caps. The depressions are very shallow, and if the objects were placed on the head they would merely perch there as long as they were supported by the hands. No fabric is incorporated with the clay, and many of the dummies show in the depressions the finger marks of those who kneaded them.

According to published evidence corroborated by the late Archdeacon Farr, it is evident that the word "widow," as applied to the caps, is not strictly correct, caps being also worn by "relatives and others."

Accompanying a cap from Blanchetown, presented by the (then) Canon Farr, is the following note, dated October 5th, 1878: "On the Murray at and near Blanchetown, when any chief among the natives dies, his relatives and others shave their heads and make helmets for themselves by laying on the pipe-clay in successive layers; some of them are very large and heavy; the one I have brought belonged, I am told, to the native's *lubra*. Some time after the man's death the tribe assemble at the grave, which is within a *wurlie*, and then with much ceremony the helmets are deposited one by one upon the grave."

It is interesting to note that whereas the objects are generally spoken of as caps, both Farr and Worsnop designate them as helmets.

As mentioned in some of the accounts quoted, the graves upon which the caps were placed were protected by a *wurlie* "almost impervious to the weather." It seems, therefore, that the long preservation of the caps was of special importance and, as they would fall to pieces with slight wetting, special precaution was taken to keep them from the rain and dew.

It is evident that the customs connected with widows' caps differed among various tribes or at different periods.

Referring to some widows' caps, the significance of which were then unknown, Mitchell (1) says they were in lime or gypsum and "had evidently been taken from a head, the hair of which had been confined by a net, as the impression of it, and some hairs, remained inside."

Bonney (11) says: "The head-covering, which is a thick cake, wears a long time; it is fixed to the head by the hair and a small net, which is generally laid over the head before the cake is plastered on. . . . I have seen an old woman wearing a patch of white plaster over the crown of her head as mourning after the death of a favourite dog."

According to Worsnop's account, the clay was placed over the hair, which, after a period of three months, had to be cut to release the helmet. According to others, the head was shaved before the first layer of clay was laid on, in which case the growing structure could be removed and replaced whenever desired,

for the sprouting hair would be protected from the subsequent layers of clay. No hair is included in the clay of any of the caps in the S.A. Museum, and the shaving of the head would not in any way prejudice the protection of the scalp by the initial layer of fabric found in some of the caps. Bulmer (12) says that after the cap was removed from the head it was baked in the fire and laid on the tomb of the deceased.

We have different statements to account for the presence, on a grave, of caps far in excess of the number of lubras a native may have had. The custom, as originally practised, may have been for all widows of the tribe, or perhaps only the older ones, to don the caps for the period between burial and the mourning ceremony, for we read in Worsnop (p. 65): "When preparations were made for the burial, two widowed gins, with hair cut short and heads covered or plastered with pipe-clay, took prominent parts in the arrangement." Archdeacon Farr stated that caps were made layer by layer, and worn not merely by the widows, but by relatives and others also. Afterwards decadence set in, the wearing of the actual cap being confined to the widow, others using dummies as ceremonial objects, which, according to Police-sergeant Ewens, were made as a pretence of deceiving visitors to the grave as to the number of lubras the deceased possessed.

If, of twenty caps found on one grave, only one, or say two, had actually been worn, it would seem to follow that the number of dummies collected and preserved by Europeans would far exceed that of the real caps. That this may not be so may be explained by drawing attention to the fact that the real caps, of shapely contour with deep depressions, and sometimes lined with net or fabric, are much more attractive than the unshapely dummies, and would therefore be picked up in preference, so that the number of dummies finding their way into collections would be relatively small compared with that produced. The natural preference for an actual cap is exemplified by the action of Archdeacon Farr in selecting, doubtless in ignorance of its special significance, what was possibly the only genuine cap on the grave, for he writes: "The one I have brought belonged, I am told, to the native's lubra."

It is probably too late now to ascertain what was the original usage in respect to the caps. If female members of the deceased's family other than the widow also wore caps, the practise has long been discontinued, the custom as regards "relatives and friends" degenerating into the use of dummies. I am informed that at a ceremony some thirty years ago, and which took place three moons after the burial of the deceased, the female mourners held the dummy caps, previously prepared, on their heads, and after the widow had discarded her cap and placed it on the grave, the mourners one by one deposited their dummies also.

The evolution of the cap is sufficiently obvious. Whitening of the head and parts of the body and limbs as a sign of mourning is practised, not only in

Australia, but in many other countries also. It may be done by dry chalking, or, as in the case of the Murray River natives, by wet pipe-clay or lime, which would partake of the nature of plastering. The scalp would form an excellent base for holding a thicker layer; in course of time it would become customary to add further layers, until the massive structure of recent years was attained.

Curr (12) has expressed the same idea in the following words: "To plaster the head with clay in time of mourning is very common throughout Australia, and the *kopi* is merely an exaggeration of the custom."

Though the helmet shape was possibly aimed at, owing to the plastic nature of the clay, this could not be formed at once, hence the retention of the method of production by successive layers. In the case of the manufacture of dummies, where the personal element did not exist, the object was kneaded solidly and a make-believe depression formed by scooping out with the fingers.

The following examples are preserved in the Museum:

- A. 2727. From Moorna, N.S. Wales. Presented by Mr. A. J. Murray, and accompanied by this note: "This cap was taken from the grave of King Rufus Billy (whose name ought to be Rufus Jimmy), of Lake Victoria, N.S. Wales. His skeleton (mounted) is in the collection." This cap is illustrated on plate xxvi, fig. 1.
- A. 2728. From Blanchetown. Presented by the Countess of Kintore, 1891. A real cap, now somewhat distorted.
- A. 2729. From Murray River. Purchased. A real cap, the edge broken.
- A. 2730. From Morgan. Presented by Mr. F. W. Gierkens, 1906. A real cap, rather small.
- A. 2731. From Blanchetown. Presented by the Ven. Archdeacon Farr, 1878. This is a real cap, and straw has been used in its manufacture.
- A. 2732. From Chowilla. Presented by the Ven. Archdeacon Bussell, 1898. The dummy illustrated on plate xxvii, fig. 3.
- A. 2733. From the same source as the preceding. A real cap, illustrated on plate xxvi, fig. 2.
- A. 2734. From Mannum. Presented by Sir Edward Stirling. A dummy of helmet shape, showing finger marks in the depression.
- A. 2735. From the same source as the preceding. A real cap.
- A. 2736. From Murray River. Purchased. A dummy, showing finger marks.
- A. 12903. A large dummy from mouth of Rufus River, Lake Victoria, N.S. Wales, 1908. Found by Mr. W. T. Smith and presented by Mr. H. S. Taylor, 1924.
- A. 12904. From Chowilla. Presented by Constable L. Taylor. A real cap, lined with bagging.

A. 12905. A small dummy cap, without record, showing finger marks. Illustrated on plate xxvii, fig. 4.

A. 12906-8. Dummies without record.

Note. Moorna and Lake Victoria (Nos. A. 2727, A. 12903) are on the Murray, just within the N.S. Wales border and near to Wentworth.

### **Explanation of Plate xxvi.**

#### **Widows' Caps of the Murray River Natives.**

Fig. 1. Cap from Moorna. Presented by Mr. A. J. Murray. Size,  $305 \times 230$  mm.; weight,  $9\frac{1}{2}$  lb. Lined with calico. Reg. No. A. 2727.

Fig. 2. Cap from Chowilla. Presented by Ven. Archdeacon Bussell, 1898. Size,  $260 \times 230$  mm.; weight, 16 lb. Lined with bagging. Has evidently been damp after wearing, part of the wall having sagged inwards. Reg. No. A. 2733.

### **Explanation of Plate xxvii.**

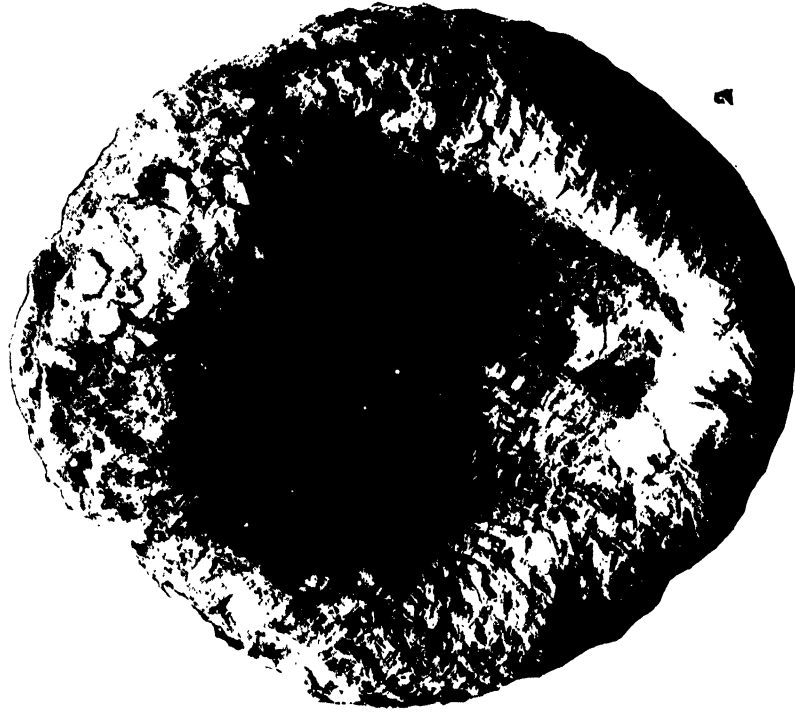
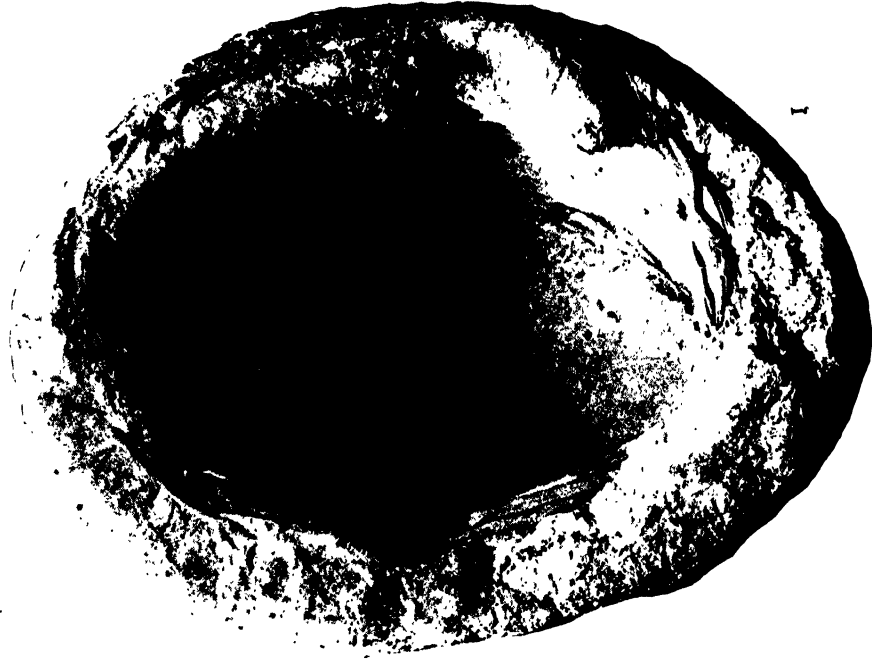
#### **Dummy Caps of the Murray River Natives.**

Fig. 3. Dummy from Chowilla. Presented by Ven. Archdeacon Bussell, 1898. Size,  $236 \times 233$  mm.; weight,  $14\frac{3}{4}$  lb. Dummy caps were not lined; the fabric markings on this specimen were doubtless caused by placing the object, whilst damp, on bagging. Reg. No. A. 2732.

Fig. 4. History unknown. Size,  $210 \times 204$  mm.; weight,  $7\frac{3}{4}$  lb. Shows the finger marks produced in making the shallow depression which, with the circular shape of the object and absence of layering, is characteristic of dummy caps. Reg. No. A. 12905.

### **Explanation of Plate xxviii.**

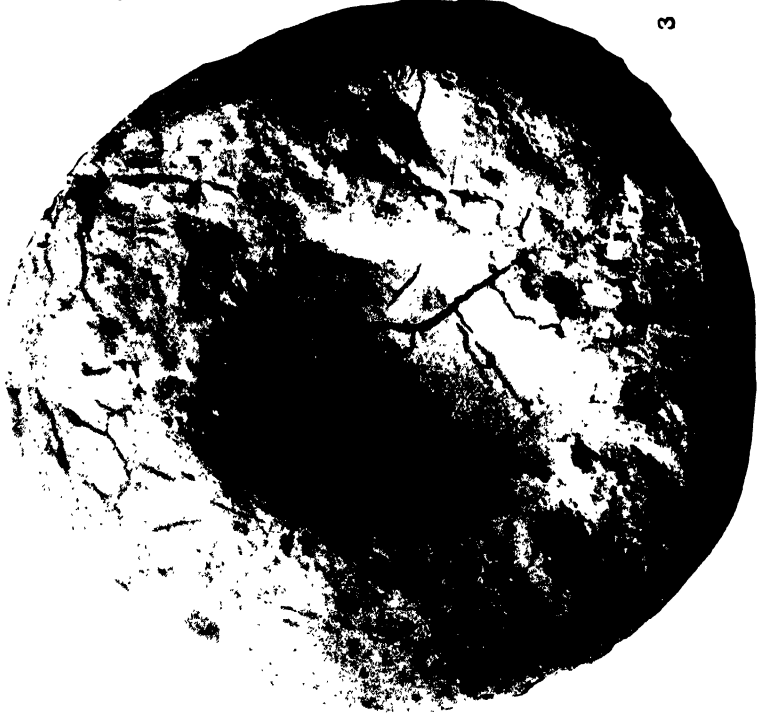
Photograph of a native grave, near the Rufus River, Lake Victoria, N.S. Wales, taken by Mr. C. Reiners and reproduced by permission of Dr. W. Ramsay Smith. The caps were removed from the surface of the graves, one of which is covered by the wurlic. Most of the caps appear to have been genuinely worn, but it is unlikely that all were taken from one grave; the best examples from other neighbouring graves being possibly gathered together and arranged for the benefit of the photographer.



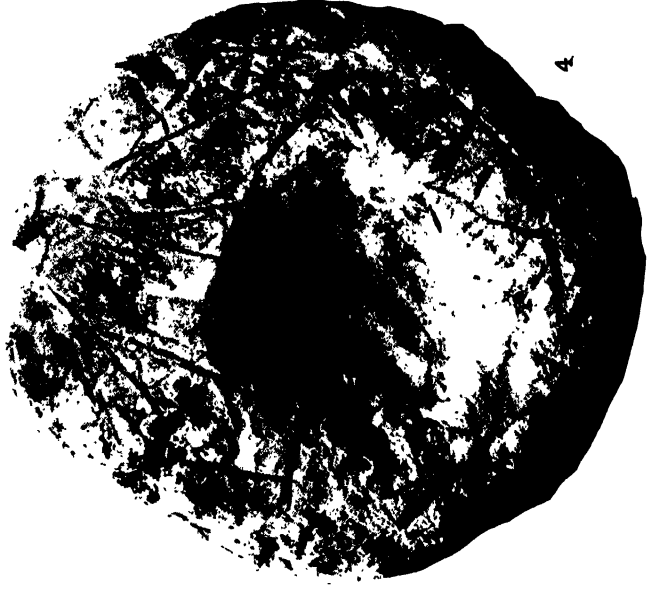
WIDOWS' MOURNING CAPS.







3



4

DUMMY MOURNING CAPS.





GRAVE WITH MOURNING CAPS.



# ILLUSTRATIONS OF AND NOTES ON SOME AUSTRALIAN FISHES.

By EDGAR R. WAITE, F.L.S., C.M.Z.S., DIRECTOR, SOUTH AUSTRALIAN MUSEUM.

Plates xxix-xxxi and text figs. 379, 380.

WHEN preparing the Catalogue of the Fishes of South Australia<sup>(1)</sup> and later, the resultant "Handbook,"<sup>(2)</sup> it was sought to republish as many illustrations of the species included as could be obtained. The very unequal character of the pictures is accounted for by the fact that, whereas many of the blocks were produced from illustrations appearing in old books, others are reproductions from recent works, mainly by Mr. McCulloch or myself. The usage of the former when compiling his "Check List of the Fishes of New South Wales,"<sup>(3)</sup> was quite similar. The large majority of Australian fishes has been illustrated; some have not yet been figured, while in some cases there are many pictures of a species from which to choose, and, as time goes on, better illustrations of all species will be forthcoming. *Threpterus maculosus* will furnish an example. In the "Catalogue" the block of 1850 was reproduced, but for the "Handbook" an illustration produced in 1923 was utilized; it is difficult to realize that the two drawings are intended to represent the same fish (numbered 189 in both publications).

The following species are herein dealt with:

*Dactylosargus arcidens* Richardson. A new record for the State and not previously illustrated.

*Pseudaphritis urvillii* Cuvier & Valenciennes. Previously represented only by the figure of 1831.

*Ophielinus gracilis* Waite. In verification of an unsatisfactory record for South Australia and illustrating intensive markings.

*Gnathanacanthus goetzeei* Bleeker. A new illustration of a liberally depicted species.

*Histiophryne bougainvilli* Cuvier & Valenciennes. A new record for New South Wales.

*Spheroides pleurogramma* Regan. An illustration made in overlooking the existence of a previous one. The new illustration is, however, published, as it will be more accessible here than that issued in London.

(1) Waite, Rec. S.A. Mus., ii, 1921.

(2) *Ibid.* British Science Guild (S.A. Branch) Handbook, 1923.

(3) McCulloch, Australian Zoological Handbook, No. 1, 1922.

RECORDS OF THE S.A. MUSEUM  
FAMILY APLODACTYLIDAE.**DACTYLOSARGUS ARCTIDENS Richardson.**

- Aplodactylus arctidens* Richardson, Proc. Zool. Soc., 1839, p. 96, and Trans. Zool. Soc., iii, 1849, p. 81.  
*Haplodactylus arctidens* Günther, Cat. Fish. Brit. Mus., i, 1858, p. 81.  
*Dactylosargus arctidens* Gill, Proc. Acad. Nat. Sci., Philad., 1863, p. 110.  
*Haplodactylus maeandratus* Klunzinger, Arch. f. Naturg., xxxviii, 1872, p. 22 (not Richardson).

Plate xxix and text fig. 379.

This fish was originally described from a specimen taken at Port Arthur, Tasmania, but Johnston<sup>(4)</sup> says it is rare and seldom seen in the market. It does not appear to have been recorded, under the name *A. arctidens*, from any other district. Klunzinger chronicles the Victorian representative as *H. maeandratus* Richardson, a New Zealand species, and suggests that *H. arctidens* is a synonym.

Not having seen a specimen of Solander's *Sciaena maeandratus*, Richardson compiled his description, in part, from a drawing; important comparative features are not therefore supplied. Under the circumstances, it appears advisable to regard the New Zealand fish as distinct, for the present, and to accept the Victorian record as applicable to *D. arctidens*, the range of which may be cited as Tasmania, Victoria, and South Australia. If further direct comparison indicates that the two are identical, and if the publication of the two names is to date from Richardson's usage, *D. arctidens* has priority by ten years.

In his Synopsis of the Family of Cirrhitoid Fishes, above referred to, Gill elevated several Australian and New Zealand fishes to generic status; in addition to *Dactylosargus* for *Aplodactylus arctidens*, we have *Crinodus* for *A. lophodon*, *Dactylopagrus* for *Cheilodactylus carponemus*, *Latridopsis* for *Anthias ciliaris*, and *Goniistius*, which includes our *G. bizonarius*.

The subject of the present note is a specimen forwarded by Mr. A. E. Waterman (a generous donor of fishes to the Museum), who received it in a consignment of fish from our southern shores: it constitutes a record for South Australia. The following is a description of the specimen:

D. xvi, i, 17; A. iii, 6; V. i, 5; P. 8, 6; C. 17; L. 1, 103; L. tr., 20, 76.

Length of head, 4.2; depth of body, 3.5, and length of caudal 5.5 in the length, caudal excluded; diameter of eye, 5.8; interorbital space, 3.8; and length of snout, 3.1 in the head.

(4) Johnston, Pap. and Proc. Roy. Soc. Tasm., 1882 (1883), pp. 70, 111.

The dorsal and ventral profiles are evenly and subequally convex, that of the former being disturbed only by a tumidity over the nostrils. The mouth is overhung by a bulge above the upper lip, its cleft being horizontal. The maxilla extends to below the posterior nostril, which is a rimmed pore placed close in front of the eye; the anterior nostril has a skinny flap. The opercle has two soft spines, the upper directed to the lateral line, the lower to the opercular flap. Gills four, a very short slit behind the fourth; gill-rakers very short, nineteen in number on the first arch, of which seven are on the upper limb.

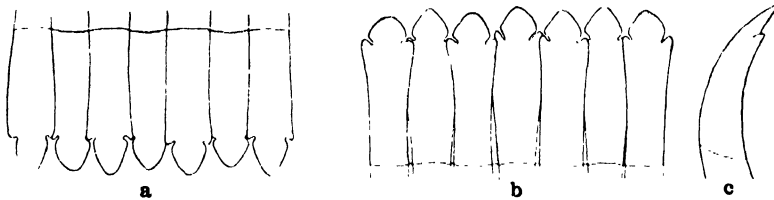


Fig. 379. Teeth of *Dactylosargus arctidens*; a, upper, b, lower, c, side view.

**Teeth.** There are five or six irregular rows of teeth in each jaw, those of the hinder rows being smallest; these, the younger teeth, are relatively wider at their summits. Each tooth is curved backwards and is trilobed, the median lobe much the largest and subacute. The actual shape is shown by the diagrams. Vomer and palatines toothed; tongue smooth.

**Fins.** The dorsal fin commences close behind the head; the length of its first spine is less than the diameter of the eye, the fourth and fifth are longest, 1.7 in the head; thence the fin falls to the sixteenth spine, which is shorter than the first; the spines of the second fin support the first ray, whose length is equal to the longest spine of the first dorsal, the fin thence falls rapidly; the base of the spinous dorsal lies in a scaly sheath, and is longer than that of the second dorsal. The anal, placed beneath the middle of the soft dorsal, has a short base, which also lies in a scaly sheath; the first spine is very small, the third spine, which is not half the length of the longest ray, is enclosed in the membrane of the first ray and appears to be longer than it is; the second ray is the longest, 1.3 in the head; the pectoral is slightly shorter than the head and obtusely pointed, the seventh split ray being longest; the ventral is placed less than an eye diameter behind the origin of the dorsal, and is nearly equal to the pectoral in length; when adpressed it reaches only half-way to the anal. The caudal is large, with its margin incised; the depth of its peduncle is half the length of the head.

**Scales.** The head is naked, with the exception of two patches of very small scales on each side; a narrow strip originates at some distance behind the eye and occupies the median part of the preopercular region, running forward toward



the mouth; the second patch is similarly disposed in respect to the opercular region. The scales on the body are cycloid and small, and scalelets are developed along the proximal portions of the caudal rays. The lateral line follows the dorsal curvature from behind the upper opercular spine to the base of the caudal rays, passing along the middle of the peduncle.

*Colours.* The ground colour is dark greenish-brown above, lighter on the sides, and white beneath; there are indications of four cross bars, represented by irregular black patches, one in front of and including the anterior spines of the dorsal fin, a second below the middle of that fin, another below the middle of the soft dorsal, and a fourth on the caudal peduncle. The lighter markings suggest a series of chains laid longitudinally, irregularities being accounted for by supposing that some of the links are seen sideways, pushed out of line, etc.; the markings are continued on to the belly, but are rather faintly indicated. The simile used in describing the body markings may be extended to those of the head, but hereon the links have been pushed out of line and appear vertically on the opercles; on the peduncular portion of the tail the markings appear as irregular white spots. The first dorsal is dusky, with a light area basally; the soft dorsal is similarly darker towards the margin, but has lighter blotches and a median sub-basal black mark corresponding to the body blotch below it; the pectoral has ring-like markings, and the anal and caudal light blotches; the ventral is pale basally, its distal half being black. The accompanying figure will show more clearly the disposition of the markings of the species, which has not been previously illustrated under the name *D. arctidens*. Length, 385 mm.

#### **PSEUDAPHRITIS URVILLII Cuvier & Valenciennes.**

*Aphritis urvillii* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 484, pl. cexliiii.

*Pseudaphritis bassi* Cast., P.Z.S., Viet., i, 1872, p. 92.

*Aphritis bassi* Ogil., Rec. Aust. Mus., i, 1890, p. 68.

*Pseudaphritis urvillii* Ogil., P.L.S., N.S.W., xxii, 1898, p. 560.

Plate xxx, fig. 1.

The only original figure of this species hitherto published is that in the "Histoire Naturelle": it has been several times reproduced, one such reproduction is published in the "Catalogue of Fishes, S.A." This illustration, though quite recognizable, does not indicate some of the characteristic markings, for, in addition to the dorsal blotches, there is a dark stripe below the lateral line connected by cross bars at intervals with another stripe more or less broken, which runs along the side of the abdomen; the upper pectoral rays are spotted like the dorsal, and the caudal has more than the three rows of spots shown. Ogilby (1890) refers to the oblique bars on the cheek, but not to the spots on the outsides of the ventrals, as exhibited by our examples.

The species is adequately described by Ogilby in an Australian publication as above noted.

The specimen here figured was obtained in Tasmania by Dr. R. H. Pulleine. It measures 215 mm. in length.

In South Australian creeks *Pseudaphritis urcillii* is freely taken in association with *Galaxias attenuatus* and *G. olidus*, and in southern streams with *Gadopsis marmoratus* also.

The following account of this fish by Mr. H. M. Hale<sup>(5)</sup> shows its adaptability to gradually changed environment:

“Towards the close of last summer a friend and I obtained some fishes from the coast, at a spot where fresh water from a river mixes with the sea water from Port Adelaide. Here we found that the normally brackish creek was but a series of large disconnected pools, in which the water, owing to months of evaporation, had become much saltier than the sea. The increase of salinity having been very gradual, Gobies [*Mugilogobius galwayi*], Atherines and Congollies had accustomed themselves to the new conditions and were present in great numbers. We collected dozens of the last-named fish, and on reaching home placed several direct from the salt into fresh water. At first the movements of the gill-covers were abnormally rapid, but otherwise the fishes showed no discomfort at the abrupt change. In a few minutes they were busily feeding on mosquito larvae, and now, six months later, are still quite healthy. After this long sojourn in fresh water, I recently put one of them into a marine aquarium; the result of the sudden transference was as before, the fish immediately accepting food.”

Mr. Hale informs me that afterwards another specimen, removed from fresh water, was dropped into water dipped from the brine pool, but it was unable to accommodate itself to the sudden change and remained at the surface, where it died.

## FAMILY BLENNIIDAE.

### **OPHICLINUS GRACILIS** Waite.

*Ophiclinus gracilis* Waite, Rec. Aust. Mus., vi, 1906, p. 207, pl. xxxvi, fig. 6.

Text fig. 380.

This strikingly marked species was originally described from examples taken in rock pools in New South Wales, where it is not uncommon. Mr. McCulloch publishes its length as 2½ inches. The record of the species for this State was not wholly satisfactory, and I am pleased, therefore, to verify its inclusion. During a recent visit to Kangaroo Island, as a guest of the Flinders Chase Board, I worked

(5) Hale. “Aquatic Life,” v, 1920, p. 25.

a large rock pool at Vivonne Bay and obtained two specimens, measuring respectively 93 mm. and 91 mm. in length: they are therefore larger than the New South Wales records, but of the same size as the original illustration, which is larger than the specimen it represented. To the description it may be added that the lateral line is strongly raised and consists of seventeen long perforated tubes, which appear to have no relation to the series of body scales; the latter number about 225 and  $4 + 5$  in the transverse series.



Fig. 380. *Ophiclinus gracilis*.

The markings are very similar to those of the type specimen, but are, as will be seen from the accompanying diagram, rather more extended; the dorsal and ventral stripes are connected at intervals, so that a regular series of light spots is formed on the hinder part of the body; the projections of the stripes on to the dorsal and anal fin rays respectively are more numerous, and the condition, or rather effect, is imitated on the caudal rays.

## FAMILY GNATHANACANTHIDAE.

### **GNATHANACANTHUS GOETZEEI** Bleeker.

*Gnathanacanthus goetzei* Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 41, fig. 1.

*Holoxenus cutaneus* Günth., A.M.N.H. (4), xvii, 1876, p. 393.

*Beridia flava* Cast., P.L.S., N.S.W., ii, 1878, p. 229, pl. ii.

*Holoxenus güntheri* Johns., Pap. and Proc. Roy. Soc. Tasm., 1883, p. 115.

*Gnathanacanthus goetzi* Gill., P.U.S. Nat. Mus., xiv, 1891, p. 701, fig.

Plate xxxi.

There appears to be little or nothing to add to Gill's admirable collation of facts relating to this species, but some remarks may be made on the published illustrations. Bleeker's original figure, issued in 1855, is really good, but somewhat crude. The eye is represented as cleanly delimited, whereas it lies in a well-defined ocular area. The dorsal fins are shown as well connected, and the lateral line is drawn as terminating beneath the middle of the second dorsal; the pectoral and ventral fins appear to be short, and the rays of the pectoral and caudal are

rather fantastically represented. Owing to excessive shading, Castelnau's figure produces the effect of rotundity, the opposite condition being characteristic of the fish; the two dorsals are not united, and the continuation of the membranes of the dorsal and anal fins is very pronounced. The figure published by Gill was copied from that of Bleeker, but the artist, without seeing an example of the fish, straightened out some of the fin rays.

The following is a description of the specimen figured:

D. viii; V. 9; A. ii, 8; V. i, 5; P. 11; C. 12.

Length of head, 2.2; depth of body, 2.6; and length of caudal, 2.4 in the length; diameter of eye, 9.5; interorbital space, 7.7; and length of snout, 3.5 in the head.

The upper profile of the head and the slightly concave forehead form an angle at the base of the first dorsal spine, thence to the caudal the direct line is broken by the tumidity forming the base of the second dorsal; the base of the anal is similarly raised; the head is deep and strongly compressed with marked pre-orbital subdorsal and opercular ridges; mouth oblique, the maxilla extending to below the first third of the eye; the lower jaw much the longer, deep, and forming a prominent "chin"; anterior nostril with a small skinny flap, posterior nostril a simple pore. Gills four, a small slit behind the fourth; gill-rakers stout, each surmounted by a spinous knob; there are twelve on the first arch, of which four are on the upper limb, the first four of the lower limb are paired.

*Teeth.* A narrow band of granular teeth in each jaw; palatines, vomer, and tongue naked.

*Fins.* All the fins are large; the first dorsal commences at the angle over the eye, its penultimate spine placed over the opercular flap; the first spine is long but malformed, the third is longest, 1.7 in the head, the last is small, sub-equal to the first of the second dorsal, whence it is separated by space equal to that between the spines of the first dorsal, but connected by a very low membrane; the spines of the second dorsal rise regularly, the gradation being continued by the rays, the third and fourth of which are longest, 1.36 in the head; the rays are simple, a character of all the fins, caudal included, the anal commences below the fourth spine of the second dorsal, and the rest of the fin forms a lobe similar to but smaller than that of the dorsal. The fins terminate almost evenly, about the depth of the peduncle from the base of the caudal; the second anal spine is longer than the first, being 2.8 in the head; the fourth and fifth rays are equal and longest, 1.6 in the same; the pectoral is large, and extends to beyond the origin of the anal; the two upper rays are conjoined at the base. The ventral spine is equal to the second of the anal, and the second and third rays to the fourth and fifth.

*Body.* Greatly compressed, the hinder portion especially, devoid of scales, but covered all over with granular warts, which cover also the fin spines, rays, and membranes, and even the branchiostegal rays, which are apparently not concealable by the operculum; the lateral line arises over the opercle close below the dorsal edge, and, leaving the profile below the soft dorsal, terminates above the middle of the peduncle evenly with the posterior insertion of the dorsal and anal membranes.

*Colours.* Head and body scarlet, paler below. All the fins of similar colour, but darker than the body, the upper part of the first dorsal excepted.

Length, 262 mm. The specimen was taken by Mr. Andy Beyer at Encounter Bay, and sent to the Museum by the kind offices of Prof. T. G. B. Osborn.

### **HISTIOPHRYNE BOUGAINVILLI Cuvier & Valenciennes.**

See McCulloch and Waite, this publication, i, 1918, p. 72, pl. vii, fig. 1.

The subject of this record is a small example, 53 mm. in length. It was obtained by Mr. Edwin Ashby, at Port Stephens, and thus constitutes a new record for New South Wales. The species was first described in 1837, but the habitat was unknown until 1918, when it was determined as Australia from examples taken in St. Vincent Gulf, South Australia. The colouration of these specimens was unknown, but the original example was said to be reddish.

Mr. Ashby says that, when fresh, the colour was deep yellow, the body and fins being ornamented with large circular verdigris coloured spots.

### **SPHEROIDES PLEUROGRAMMA Regan.**

*Tetodon pleurogramma* Regan, Proc. Zool. Soc., 1902, p. 300, pl. xxiv, fig. 2.

*Spheroides pleurogramma* McCulloch, Proc. W.A. Mus., i, 1914, p. 227 (*syn.*).

*Spheroides lacrimosus* Waite, Handbook, Fishes S.A., 1923, p. 226.

Plate xxx, fig. 2.

The common toadfish or toad of our waters has generally been regarded as *S. richiei* Fréminville, but when preparing the Handbook, above noted, it was found that the identification was incorrect. I prepared a description and a drawing, intending to establish the species later. At the time I overlooked the fact that Mr. Regan had already done that much. The new description is published, as it may be the more readily consulted here, and a figure drawn from a fresh specimen may have an advantage over one made from a preserved example.

D. 11; A. 8; P. 12; C. 10.

Length of head, 3.2; length of caudal, 4.6 in the length; diameter of eye, 4.4; and length of snout, 2.4 in the head; interocular width, twice the diameter of the eye. Two nostrils on each side, in a papilla.

*Fins.* Pectoral fin half the length of the head; origin of dorsal slightly in advance of that of the anal, caudal truncate.

*Spines.* The spines extend from the nostrils to the hinder margin of the pectorals above and from below the eyes to the vent below; they are especially strong in advance of the pectoral, and some border the anterior edge of the gill-opening. A low ridge along the lower side of the hinder part of the body deflected upwards at the base of the caudal rays. The course of the lateral line is indicated in the figure.

*Colours.* Greyish-green above, with dark-brown reticulations, four broad dark bars cross the back, one behind the eye, one in the space covered by the pectoral, a third at the base of the dorsal, and the last on the caudal peduncle. These bars descend to a horizontal stripe, which passes along the middle of each side and separates the colouring of the back from the immaculate lower surfaces. Numerous black bars descend across the cheeks, but thin out below; the two broadest lie, one below the eye, the other between it and the gill-opening.

Length of specimen described, 185 mm.

*Loc.* Port Adelaide River. Reg. No. F. 828.

The distribution of this species has been stated as "Australia," with Sydney as one definite locality therein, and it has long been known to be common there under the name *S. hypselogeneion*. It is very common in St. Vincent Gulf, attaining a length of 215 mm.

### Explanation of Plate xxix.

*Dactylosargus arctidens* Richardson.

Specimen, 385 mm. in length, from South Australia.

### Explanation of Plate xxx.

Fig. 1. *Pseudaphritis urvillii* Cuvier & Valenciennes.

Specimen, 215 mm. in length, from Tasmania.

Fig. 2. *Spheroides plucrogramma* Regan.

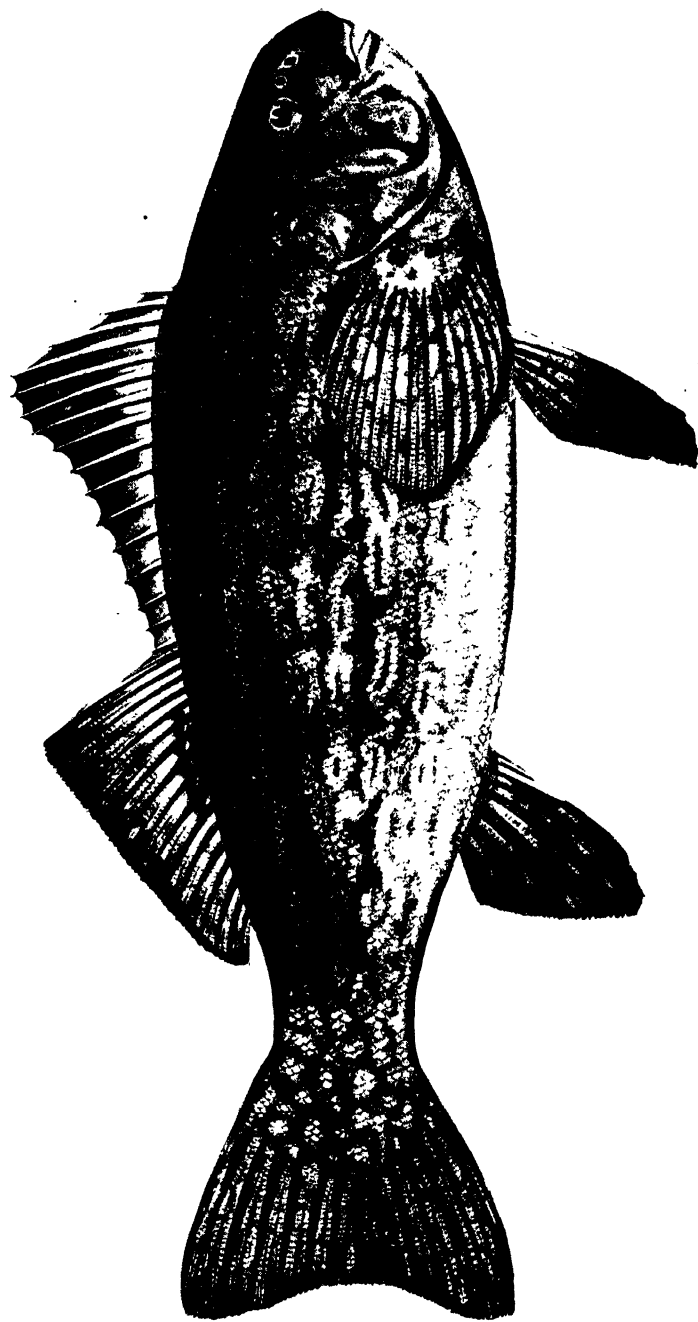
Specimen, 185 mm. in length, from Port Adelaide River.

### Explanation of Plate xxxi.

*Gnathanacanthus goetzeei* Bleeker.

Specimen, 262 mm. in length, from Encounter Bay.



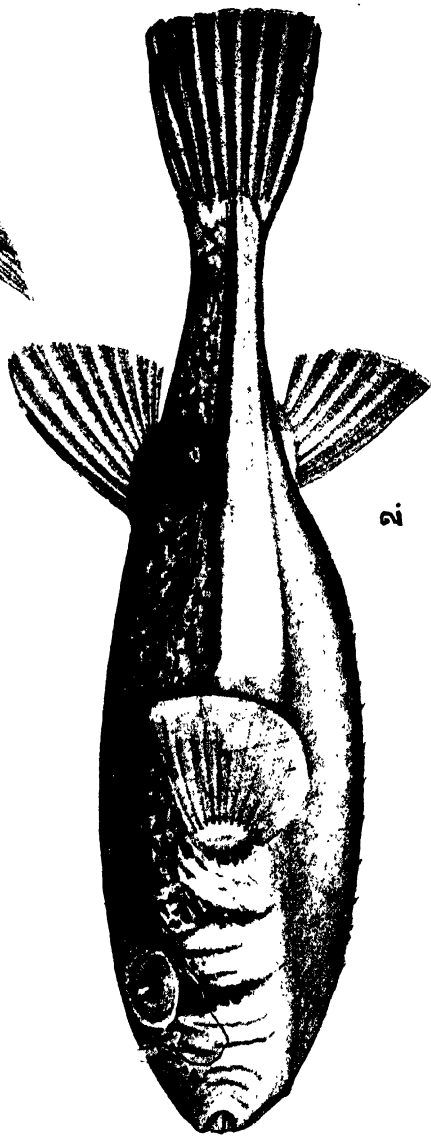
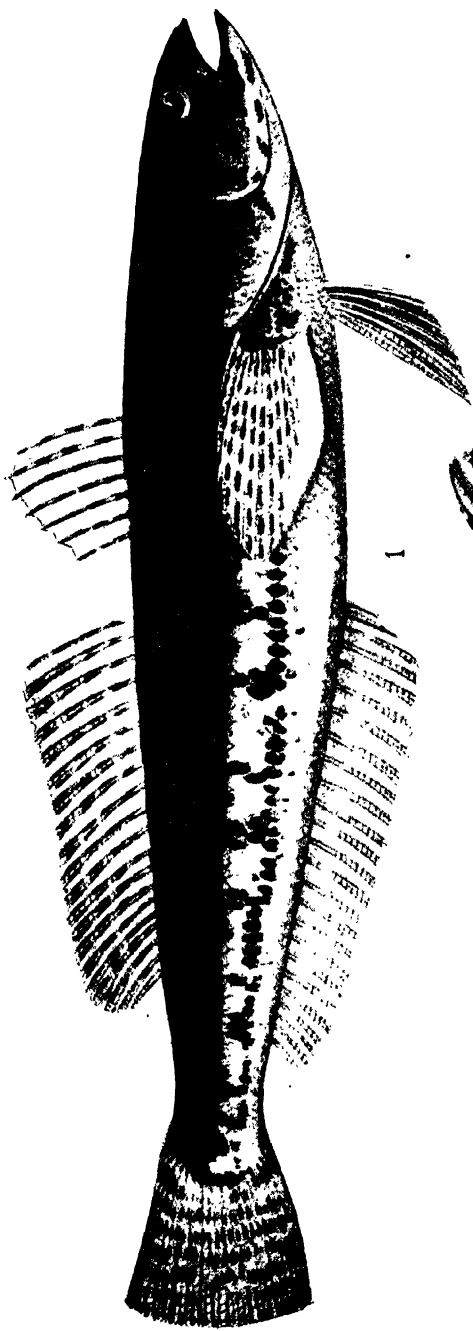


Edgar R. Waite, del.

*DACTYLOSARGUS ARCTIDENS.*

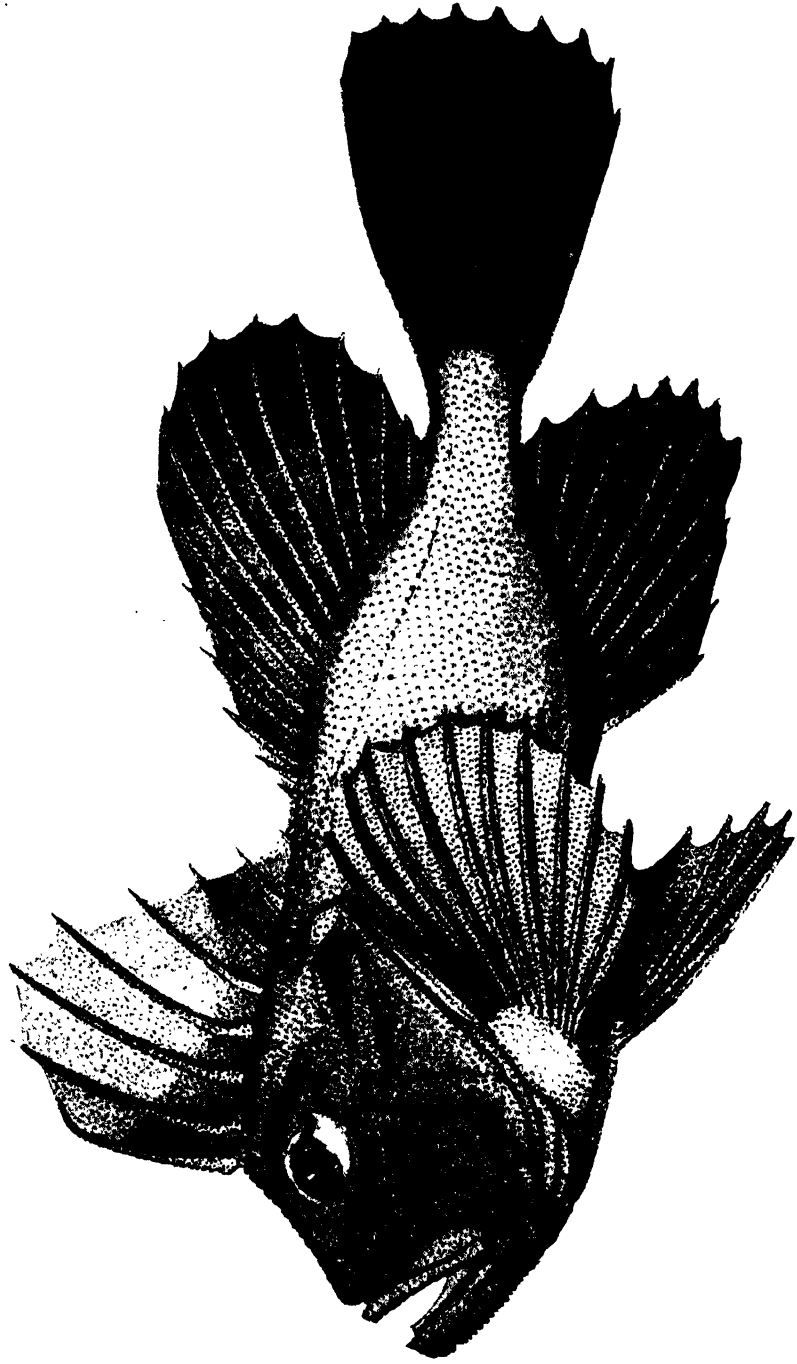






2.





Edgar B. Waite, del.

GNATHANACANTHUS GOETZEEI.



## RECORD OF EUROPEAN LAND MOLLUSCS INTRODUCED INTO SOUTH AUSTRALIA.

BY SIR JOSEPH VERCO, M.D., F.R.C.S., HON. CURATOR IN MOLLUSCA.

### **HELIX PISANA Müller.**

*H. pisana* Müller, Vermes Histoire terr. et fluv., ii, 1774, p. 60; Pfeiffer, Conch. Cab. Küster, Band i, Abt. 12, 1846, p. 161, Sp. 128, Taf. 22, figs. 1-6, Taf. 37, figs. 1-12; Chenu, Illus. Conch., iii, 1850, pl. vii, figs. 12 to 12h; Forbes and Hanley, Hist. Brit. Moll., iv, 1853, p. 56, pl. 115, fig. 78; Jeffreys, Brit. Conch., i, 1862, p. 207; Tryon, Man. Conch., Second Series, iii, 1887, Helicidae, i (Group Helicella; Section Xerophila Held, Subsection Euparypha Hartmann), p. 224, pl. 53, figs. 36-42; Pilsbry, Man. Conch., Ser. ii, ix, 1894 (Genus Helix, Subgenus Euparypha Hartmann, 1842), p. 336.

At the end of December, 1923, some land shells were sent to the Museum from Millicent, with the information that they were "playing havoc" with the barley crops there; they had only been seen in the district for two or three years, and this year had appeared just after the unusual late rains. On examination they proved unlike any land shells indigenous to South Australia and were diagnosed as *H. pisana* Müller. This identification was confirmed by Mr. C. Hedley, of the Australian Museum, Sydney.

*Hab.* It is named from Pisa, in Italy. "It occurs in dry sandy places only in the neighbourhood of sea beaches along the south coast of Europe, also in England and Sweden, in Algiers, on the Canary Islands and Madeira," "and in the Azores."

It varies considerably in shape and still more in ornament, so that its synonymy is very extensive. Pilsbry, *loc. cit.*, gives seven varieties and three or four synonyms. Many more of the latter are enumerated by other authors quoted.

The South Australian examples examined are milky-white with a whiter peripheral band, the base is light-brown fading to white at the umbilicus, which is also sometimes brown. Four to six darker narrow brown bands below the periphery may encircle the base. The whorls may have axial flames, which later are confined to the lower half of the whorls and become included between two broken dark-brown hairlines, which run round the body-whorl above the peripheral white band. The two apical whorls are dark chocolate and shining. The last whorl is scarcely decurrent near the aperture, and the columella is very slightly reflected at its base, so as to scarcely reduce the umbilicus. The interior of the aperture is dark chocolate, fading in the throat to yellowish, and the line of thickening just within the margin is light yellow-brown.

They differ from most European examples in the Adelaide Museum, in the absence of the numerous striae or incisions encircling the whorls; but some specimens from Montpellier, in Southern France, are equally devoid of them.

### **HELICELLA ERICETORUM Müller.**

*Helix ericetorum* Müller, *op. cit.*, p. 33; Pfeiffer, *op. cit.*, p. 167, Taf. 22, figs. 21-26; Forbes and Hanley, *op. cit.*, p. 61, pl. 117, f. 4; Reeve, *Conch. Icon.*, 1854, pl. cciv, Sp. 1442; Jeffreys, *op. cit.*, p. 216; Tryon, *Helix* (Group *Helicella*, Section *Xerophila*, Subsection *Helicella*), p. 245, pl. 60, figs. 97-99; Pilsbry, *op. cit.*, p. 252.

Some years ago, shells were sent to the Museum by Mr. F. E. Place, Lecturer on Veterinary Science at the Agricultural College, Roseworthy. They were gathered at Para Wurlie, in southern Yorke Peninsula, and were so plentiful that "hundreds were to be found in a square yard." They were said to have been imported into the district. Quite recently a further consignment of the same species was received from the Rev. K. W. Pobjoy, of Moonta, in northern Yorke Peninsula. Mr. W. J. Kimber has taken them in numbers on the sandhills at Hardwicke Bay, Spencer Gulf, on the western side of Yorke Peninsula. They are diagnosed as *Helicella ericetorum* Müller.

It has a lengthy synonymy and several varieties have been described. It has been called the "Heath Snail," which is the meaning of its name. "It lives on heaths, downs, and sandhills, on thistles and other plants."

*Hab.* France, Germany, Sweden, and Great Britain.

The shell, as found in South Australia, is nearly flat, with a very depressed spire, an impressed suture, a wide perspective umbilicus, and an unthickened unreflected labrum. It is white with a slight bluish tinge. A rather broad dark chestnut or chocolate band encircles the body-whorl at the periphery and edges the spire-whorls just above the suture. Two to five spiral chestnut bands, varying much in width in different shells or in the same shell, wind round the base, and are often smudged along the upper or lower margins; the smudges may form axial bands or flames round the umbilicus at more or less regular intervals, especially towards the aperture.

### **HELIX ASPERSA Müller.**

*Helix aspersa* Müller, *op. cit.*, p. 59; Pfeiffer, *Conch. Cab. Küster*, 1846, Band i, Abt. 12, p. xi, No. 9, and p. 34, No. 10, Taf. 3, figs. 6-10; Chenu, *op. cit.*, pl. ii, figs. 5 to 9, 10, 11 to 13; Reeve, *op. cit.*, 1852, pl. xciv, Sp. 513; Forbes and Hanley, *op. cit.*, p. 44, pl. cxvi, f. 1; Jeffreys, *op. cit.*; Tryon, *op. cit.*, iv, 1888, *Helix* (Sect. *Pomatia*, Subsection *Cryptomphalus*), p. 235, pl. 58, figs. 31-38; Pilsbry, *op. cit.*, p. 318 (Sect. *Helicogena* Ferussae, 1819).

*Hab.* England, Western Europe, and all countries bordering the Mediterranean. Introduced to adjacent islands and West Indies, North and South America, South Africa, New Zealand, and Australia. For many years it has been recognized as the common snail of South Australia.

# NOTES ON AUSTRALIAN CRUSTACEA.

No. I.

By HERBERT M. HALE, SOUTH AUSTRALIAN MUSEUM.

## FAMILY SQUILLIDAE.

Plates xxxii-xxxiii and text figs. 381-384.

IN 1883 Prof. Ralph Tate<sup>(1)</sup> published a paper dealing with the Stomatopod crustaceans preserved in the South Australian Museum, and therein described three species of *Squilla* from St. Vincent Gulf. This appears to be the only record of the occurrence of members of the group in South Australian waters. Owing to the activities of Sir Joseph Verco and others, the collection has been augmented since this time and at least six species are now known to occur on our coasts. By far the commonest is *Squilla miles*, described by Tate under the name *S. pectinata*. Kemp,<sup>(2)</sup> in his treatise on the Indo-Pacific Stomatopods, mentions that records of only two specimens of *S. miles* may be found in literature, the type from New South Wales and an example from Victoria (Miers). In 1914 Alexander<sup>(3)</sup> also remarks on the rarity of the species, but records its occurrence in Western Australia, without definite locality. It would thus seem that South Australia is the headquarters of the species, although its non-recorded occurrence in any number elsewhere may be in part due to the fact that it has escaped the attention of collectors. *S. miles* is occasionally washed up on our Gulf beaches, single specimens usually being obtained in this way. After a severe storm in 1920, however, a number of adults were picked up on the beach at Glenelg, they having been possibly killed by the increased influxion of fresh water due to the exceptional floodwaters of that year.

The widely distributed *Pseudosquilla stylifera* M. Edw., will probably be added to the species here listed for South Australia; this Squillid has been taken near Tasmania, but apparently has not yet been captured in our waters.

## **SQUILLA Fabricius, 1793.**

### KEY TO THE SOUTH AUSTRALIAN SPECIES.

- a. Raptorial dactylus with four teeth, including the longest terminal one. Antero-lateral angles of carapace not spinous . . . . . *miles* .

(1) Tate, Trans. Roy. Soc. S. Aust., vi, 1883, p. 48.

(2) Kemp, Mem. Ind. Mus., iv, 1913, p. 37.

(3) Alexander, Journ. Roy. Soc. West. Aust., i, 1916, p. 3.



- aa. Raptorial dactylus with six teeth, including the longest terminal one. Antero-lateral angles of carapace spinous.
- b. Telson with longitudinal ridges on each side of median dorsal carina. No submedian carinae on exposed thoracic and first five abdominal somites . . . . . *fasciata*
  - bb. Telson without longitudinal ridges on each side of median dorsal carina. Exposed thoracic and all abdominal somites with submedian carinae.
    - c. Inferior margin of raptorial propodus produced distally as a stout tooth. Mandibular palp absent . . . . . *laevis*
    - cc. Inferior margin of raptorial propodus rounded distally, not spinous. Mandibular palp present . . . . . *oratoria* var. *inornata*

### **SQUILLA MILES Hess.**

*Squilla miles* Hess, Arch. fur Nat., xxxi, 1865, p. 169, pl. vii, fig. 21; Miers, Ann. Mag. Nat. Hist. (5), v, 1880, p. 17; De Man, Zool. Jahrb. Syst., ii, 1887, p. 714; Kemp, Mem. Ind. Mus., iv, 1913, p. 36.  
*Squilla pectinata* Tate, Trans. Roy. Soc. S. Aust., vi, 1883, p. 50, pl. ii, fig. 2a, b, c, and d.

Plate xxxii, fig. 1 and text fig. 381, a to i.

♂ Dorsal surface more or less polished. Rostrum smooth, gently convex, usually about as long as wide, sometimes longer than wide; shape somewhat variable, subcordiform or subtriangular, widest at base or at posterior fourth, apically rounded or subacute. Eyes broader than long, reaching to about the third fourth of the length of the basal segment of the antennular peduncle; cornea bilobed, oblique, considerably wider than eyestalk; posterior margin of peduncle oblique and inner lateral margin in dorsal view shorter than outer. Carapace narrowed anteriorly, the angles rounded; front margin subtruncate and about one-half the medial length; on the posterior two-sevenths of the length is a short lateral carina, which meets the obsolete marginal carina near the postero-lateral angles, while between this ridge and the gastric groove the posterior marginal carina is bent upwards and continued forwards to the cervical groove. Mandibular palp wholly absent. The outer inferior edge of the merus and propodus of the raptorial limb roundly produced near the distal end in large examples; dorsal carina of carpus entire, terminating in a sharply rounded lobe

before reaching the anterior edge; propodus with inferior margin convex, the upper concave, a little undulating and finely pectinate; inner surface with three movable spines, the first (and largest) inserted at the proximal angle, the second situated quite close to the first, and the third placed just behind the posterior third of the length of the propodus; dactylus rather short, rapidly tapering, with four teeth, including the long terminal spine. Fifth thoracic somite with a short oblique intermediate carina; lateral process variable, produced to a more or less sharp point directed downwards and slightly outwards, or (more rarely) bluntly rounded; posterior margin truncate, a little sinuate. Last three thoracic somites with intermediate and submedian carinae, the sixth and seventh with somewhat obscure lateral carinae; posterior margins sinuately concave. Shorter ramus of

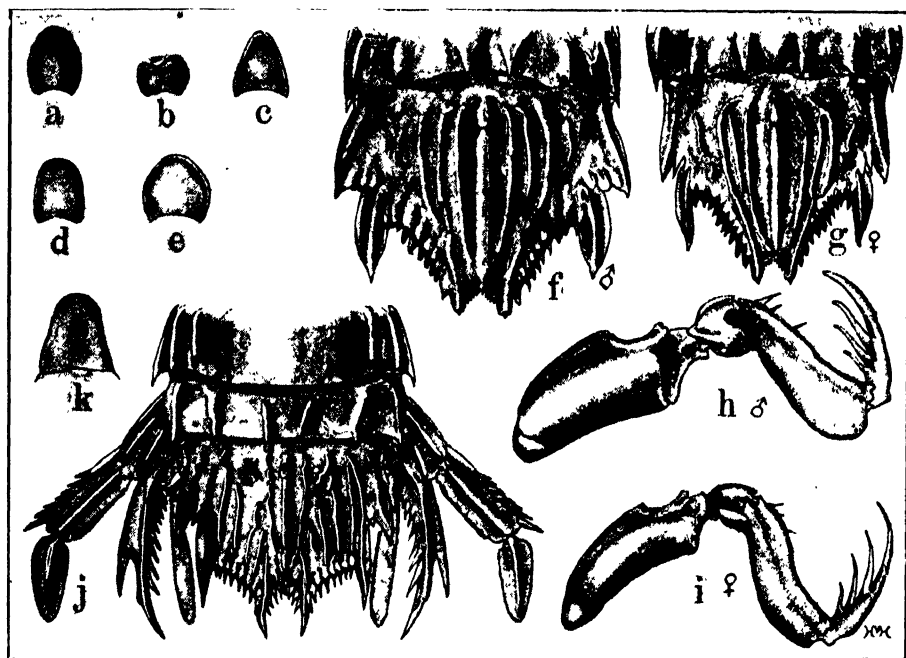


Fig. 381. a to e, variation in the rostra of adults of *Squilla miles*; a is the most common form; f and g, telson of a male of *S. miles*, 134 mm. in length and of a female 140 mm. in length drawn to same scale; h and i, raptorial limbs of the same two specimens. j, Telson, uropods, etc., and (k) rostrum of *Squilla subfasciata* Tate = *S. fasciata*.

last three thoracic appendages thin, linear, subequal in length. First five abdominal somites with hinder margins sinuately concave; with lateral, intermediate, and submedian carinae, and a very obsolete median carina; between the lateral and intermediate ridges is a narrowly triangular elevation, the base of which originates near or at the anterior margin, and in old examples is sometimes

obscurely united anteriorly to the lateral carina; the termination of this elevation does not reach to the posterior margin of the somites, but most nearly approaches it on the fifth somite. Postero-lateral angles of first four somites roundly acute-angular; marginal, lateral, and intermediate carinae of fifth somite posteriorly produced as small spines; sixth somite with a lateral, intermediate, and triangular submedian carina on each side, all produced posteriorly as spines; the elevation between the two outermost ridges is occasionally entire, but is more often oblique and broken, while in the interspace are also three to five, irregularly disposed, short oblique carinae or tubercles. Telson wider than long, the strong median crest more or less distinctly nicked near the anterior end, terminating posteriorly in a large or small spine; in one large example this spine is almost atrophied, in another it is bifurcate; on each side of the median carina are four thinner longitudinal ridges, which are always more or less broken; although three of them are usually fairly well defined, in occasional specimens only the innermost is comparatively entire; the last-named ridge may be serrated distally and sometimes has an upturned spine near the posterior end; the anterior end of any of the ridges may be forked or looped, sometimes united to the next or the next but one. The posterior margin is armed on each side with a lateral, a very strong intermediate, and a submedian tooth with movable tip, in one case the latter is immobile and bifurcate; either the second or third of the intermediate ridges may be continued on to the submedian tooth. Between the large marginal teeth are one to three lateral denticles, eight to ten intermediate, and four to six submedian denticles. Under side of telson comparatively smooth, with coarse, shallow punctures and a strong median keel. Peduncular segment of uropods with four longitudinal dorsal carinae and a spine on distal margin, inserted between the two median ridges: the bifurcate process consists of two tricarinate spines, the inner of which is the longer; inner edge of process furnished with from seven to twelve denticles, regularly decreasing in size towards the proximal end.

♀ Sexual dimorphism is apparent in large examples, but is not marked in specimens under 120 mm. in length. Females of 140 mm. to 150 mm. differ from males of the same length in the following characters: The merus of the raptorial limbs in lateral view is much less widened distally; the propodus is not dilated anteriorly, but is of about the same width throughout, as in young males. The carinae and short ridges at the bases of the marginal denticles of the telson are not swollen, whereas in large males they are roundly inflated, the short marginal ridges being almost globose.

Colour yellowish above, thickly covered with tiny sooty chromatophores, so that the ground colour appears somewhat olivaceous; carinae and spines marked with black. A submarginal black line around the carapace, and on rostrum

excepting along posterior edge. A longitudinal, curved black marking on each of the exposed dorsal somites, situate midway between the submedian and intermediate carinae.

Length (South Australian specimens), 62 mm. to 150 mm.

*Hab.* New South Wales: Sydney (type locality, Hess); Victoria (*vide* Miers); Western Australia (*vide* Alexander<sup>4</sup>); South Australia: St. Vincent Gulf (South Australian Museum).

The above description is based upon nineteen males and twenty-five females cast up on the eastern beaches of St. Vincent Gulf and collected by Messrs. W. B. Collyer, V. L. Jagoe, R. Muirhead, Williams, I. F. Yuill, and H. M. Hale. Three specimens in the collection are labelled "*Squilla pectinata* Tate, Port Adelaide Creek," by Tate himself, and are evidently some of the examples from which his description was drawn up.<sup>(5)</sup> None of our specimens is as large as the New South Wales type of *S. miles*; as previously mentioned, the species was hitherto known from descriptions of but two examples. Kemp, without having seen the species, drew up an excellent list of characters whereby it may be separated. Nevertheless, as is to be expected, the examination of a series shows that some features are subject to variation. Secondary sexual distinctions are noted by Kemp for several species, in which, as in *S. miles*, they are apparent only in the adult male.

### **SQUILLA ORATORIA de Haan, var. INORNATA Tate.**

*Squilla inornata* Tate, Trans. Roy. Soc. S. Aust., vi, 1883, p. 51, pl. ii, fig. 3a, b, and c.

*Squilla oratoria* var. *perpensa* Kemp, Rec. Ind. Mus., vi, 1911, p. 98 and Mem. Ind. Mus., iv, 1913, p. 70, pl. v, fig. 57-59 (syn.).

Under the varietal name *perpensa* Kemp separated from typical specimens of *S. oratoria* those having the median carina of the carapace interrupted at the base of the anterior bifurcation, and having, in place of the three to five dorsal tubercles or lobes on the raptorial carpos, a sharp dorsal carina terminating abruptly before the anterior margin. This author was evidently unaware of Tate's paper, and an examination of the types of *S. inornata* shows that Kemp's variety cannot be separated from them. On the carapace of both of Tate's specimens and in another from Queensland the anterior branches of the carina are only slightly interrupted immediately above the bifurcation, but the raptorial carpos has an unbroken dorsal carina, as described and figured by Kemp.

(4) Alexander, Journ. Roy. Soc. West. Aust., i, 1916, p. 3.

(5) Tate, *loc. cit.* bottom par.

This form has been previously recorded from Northern Australia, but is probably rare on our southern coast.

*Hab.* China, Japan, India, Persian Gulf: North Australia: Port Darwin (*vide* Miers); Queensland: Cairns (E. Allen); South Australia: St. Vincent Gulf (Tate).

### **SQUILLA FASCIATA de Haan.**

*Squilla fasciata* de Haan, Faun. Japon., Crust., 1849, p. 224; Kemp, Mem. Ind.

Mus., iv, 1913, p. 34, pl. i, fig. 21-23 (syn.).

*Squilla subfasciata* Tate, *loc. cit.*, p. 52, pl. ii, fig. 1a, b, c, and d.

Text fig. 381, j and k.

In describing *S. subfasciata* Tate remarks that it "differs from *S. fasciata* only in the pectinated penultimate joint of the raptorial limbs, in the arched posterior margin of the carapace, and in the truncated apex of the rostral plate." The single male type has the posterior margin of the carapace concave, the rostrum rounded at apex, and other characters as in de Haan's species; the dorsal carinae of the telson are less interrupted than in the example figured by Kemp. The drawings illustrating Tate's paper are inaccurate.

*S. fasciata* is apparently a rare species, and the above specimen constitutes the only record of its occurrence in Australian seas.

*Hab.* China, Japan, India; South Australia: St. Vincent Gulf (Tate).

### **SQUILLA LAEVIS Hess.**

*Squilla laevis* Hess, Arch. fur Naturg., xxxi, 1865, p. 170, pl. vii, fig. 22; de Man, Zool. Jahrb., Syst., ii, 1887, p. 715; Stead, Zoologist (4), ii, 1898, p. 211; Kemp, Mem. Ind. Mus., iv, 1913, p. 49, pl. iii, fig. 35-37.

Plate xxxii, fig. 2.

This species was previously recorded only from New South Wales; South Australian specimens do not differ from typical representatives.

*Hab.* New South Wales: Sydney and Port Jackson; South Australia: Encounter Bay (H. Pulleine), St. Kilda (F. McCauley), St. Vincent Gulf (A. Zietz).

### **LYSIOSQUILLA Dana, 1852.**

#### **KEY TO THE AUSTRALIAN SPECIES.**

- a. Telson without a transverse row of dorsal spines near hinder margin. Raptorial dactylus with eight to twelve teeth.
  - b. Shorter ramus of sixth and seventh thoracic somites linear.

- c. Ultimate tooth of raptorial dactylus not dilated apically. Sixth abdominal somite not grotesquely sculptured .. *maculata*
  - cc. Ultimate tooth of raptorial dactylus apically dilated. Sixth abdominal somite grotesquely sculptured .. *micrsi*
  - bb. Shorter ramus of sixth and seventh thoracic somites broadly ovate.
    - d. Raptorial dactylus with eleven to twelve teeth .. *vercoi*
    - dd. Raptorial dactylus with nine teeth .. *vercoi* var. *osculans*
  - aa. Telson without a transverse row of submarginal spines, but with the hinder edge thick and deeply sculptured. Raptorial dactylus with five teeth .. *perpasta*
  - aaa. Telson with a transverse row of dorsal spines near hinder margin. Raptorial dactylus with five to seven teeth.
    - e. Penultimate tooth of raptorial dactylus considerably shorter than antepenultimate. Telson with five dorsal spines, the median of which is simple .. *acanthocarpus*
    - ee. Penultimate tooth of raptorial dactylus not shorter than antepenultimate. Telson with a trilobed median dorsal spine and two others on each side, or with seven separate dorsal spines *latifrons*
- The terminal tooth of the dactylus is included in the count in each case.

### LYSIOSQUILLA PERPASTA sp. nov.

Plate xxxiii, fig. 1, and text fig. 382.

♀ Dorsum smooth, polished, but on abdomen obscurely wrinkled. Rostrum subquadrate, non-carinate, the lateral margins very slightly convex and convergent anteriorly; anterior margin concave on each side of a median angularity, which is little produced and not acuminate. Eyes small; peduncle rather long, subcylindrical, widest at base; cornea subglobular, oblique, as wide as base of peduncle. Carapace convex from side to side, considerably narrower on anterior margin than posteriorly, where the greatest width is equal to the medial length; lateral margins convergent and posterior margin concave, the angles rounded; gastric and cervical grooves distinct, the latter not continued to lateral margins. Ischium of raptorial appendages more than half as long as merus, with an inferior and a lateral carina, both of which are continued along the edges of, and unite

anteriorly on, a distal lobe overhanging the merus; seen from above this lobe has the appearance of a slightly incurved spine; proximal two-thirds of merus obscurely carinate above, the inferior outer edge with a flat, rounded, distal expansion; carpus broad, the dorsal carina terminating before anterior margin in a distinct spine. Propodus broad and stout, convex on inner and inferior

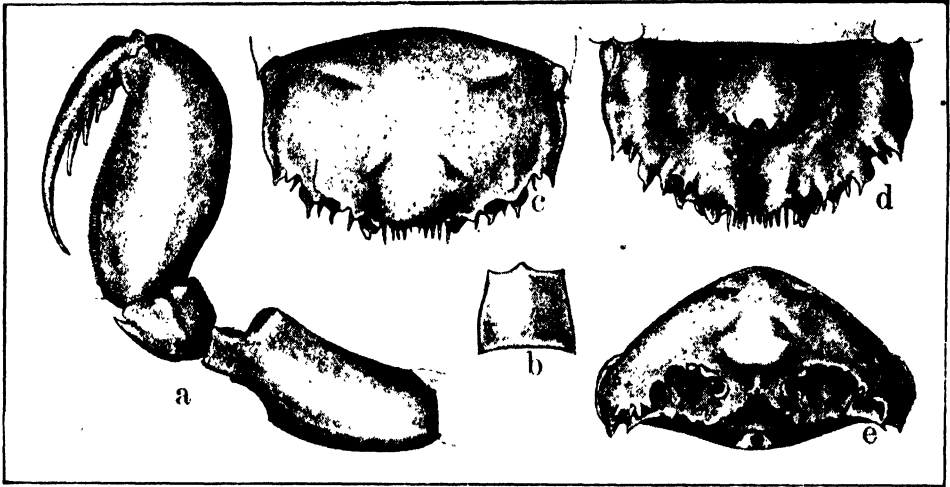


Fig. 382. *Lysiosquilla perpasta*. a, Raptorial limb; b, rostrum; c, d, and e, upper, lower and hinder views of telson.

margins, and with four movable spines on inner side, the fourth situated at the middle of the length; inner margin furnished with fine pectinations; dactylus curved, rapidly tapering, with five teeth on inner edge, the terminal tooth about as long as the remainder of the joint. Posterior margins of exposed thoracic somites truncate; lateral margins of fifth somite convergent anteriorly, of sixth to eighth subparallel; short ramus of sixth thoracic appendage broadly oval, that of the seventh larger, but a very little more elongate, while that of the eighth is elongate, very narrowly oval, and as long as its predecessor. Posterior margins of first to fifth abdominal somites concave, with the angles sharply rounded; sixth somite with a feeble spine at posterior angles. Telson very thick, its greatest depth about equal to the medial length; semicircular, very convex from side to side, a little less than twice as wide as long; on each side is an oblique fovea near anterior margin and another some distance behind the first and inclined in the opposite direction; a very obtuse and obscure median tumidity is slightly produced posteriorly, forming a wide rounded lobe, with a small median incision, curved down and a little overhanging the posterior margin, but not quite reaching backwards to its level; at the left posterior angle of this lobe is a

small tubercle. On each side of the thick hinder portion of the telson are two irregular craters quite close together, with the edges raised and more or less distinctly cut into irregular, blunt teeth, which are longest on the inner edges. The posterior marginal teeth are not in line, as is usual, but are irregularly disposed; the prelateral lobe is outlined by a groove; the lateral tooth is stout, rather small, and with a blunt tubercle on the basal half of its dorsal slope; above the level of the lateral is an intermediate tooth, with a rounded tubercle on the basal half of its outer slope; the movable, upcurved, submedian spine is partly hidden in dorsal view by the raised margins of the posterior craters. Between the lateral and intermediate teeth is a spine as large as and parallel to the first-named; above this spine, and quite close to it, is a compressed tubercle; there are two spines between the intermediate and submedian teeth, subequal in length to them; between the submedian spine and an angular median incision of the margin of the telson are four spines; the first three are subequal in length, and almost as long as the submedian spine, the innermost is minute. Below the telson is slightly convex with a median gutter on posterior portion and several less distinct ones on each side running in from between the marginal teeth. Uropods small, the inner and outer dorsal margins of peduncular segment carinate, the ridge of inner margin terminating distally in a spine; inferior bifurcate process composed of two tricarinate spines, the inner of which is broader and much shorter than the outer.

Colour in alcohol yellow, with raptorial limbs, carapace and parts of upper-surface of thoracic and abdominal somites covered with minute brown dots; these spots are absent on the head and its appendages, and on the rostrum.

Length, 57 mm. Carapace: width at anterior margin, 6.2 mm.; width at posterior margin, 11 mm.

*Hab.* Queenscliffe, Kangaroo Is. (1876). (South Aust. Mus., Reg. No. C. 184.) The type is unique.

### **LYSIOSQUILLA VERCOI** sp. nov.

Plate xxxiii, fig. 2, and text fig. 383.

♀ Dorsum smooth, somewhat polished. Rostrum cordiform, non-carinate, widest at base, anteriorly produced into an acuminate spine; surface smooth. Eyes stout and rather short, a little compressed, cornea globular, not much wider than peduncle, which is produced infero-laterally in the form of a lobular tubercle. Carapace strongly convex from side to side, a little narrower anteriorly than posteriorly, the greatest width equal to medial length; lateral margins convex; posterior margin deeply concave; angles rounded; gastric grooves well marked; cervical groove very indistinct. Ischium of raptorial limbs almost as long as



merus, its inferior margin terminating distally in a strong, flat spine, directed outwards, alongside of a blunt process overhanging the merus; merus short and broad, the anterior inferior angle lobular, rounded; dorsal carina of carpus obscure, terminating in a small, sharp spine; propodus wide and rather short, with the inferior margin convex for whole length, the inner margin slightly convex almost to extremity and armed with small pectinations; proximal end

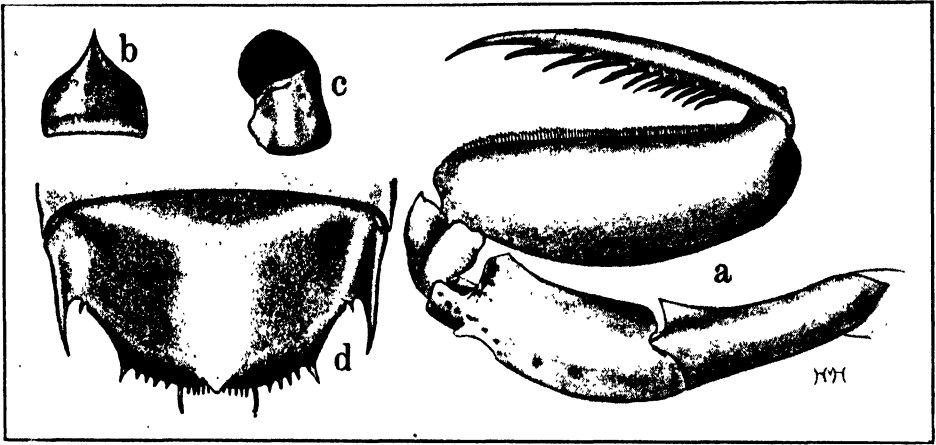


Fig. 383. *Lysiosquilla vercoi*. a, Raptorial limb; b, rostrum; c, lateral view of eye; d, telson.

on inner side with four movable teeth; dactylus slender, the outer margin slightly and evenly convex; dactylus of the left raptorial limb armed with eleven teeth, including the largest apical one, that of the right with twelve teeth. Lateral margins of fifth thoracic somite converging anteriorly, the posterior margin concave; lateral margins of sixth and seventh somites subparallel, of the eighth a little divergent; posterior margins subtruncate; anterior angles rounded, obscurely lobed, and posterior angles sharply rounded. Short ramus of appendages of sixth and seventh somites broadly obovate, the former much the smaller; that of last thoracic appendage more narrowly oval, but by no means linear. Posterior angles of first to fifth abdominal somites angularly rounded; sixth somite with a somewhat small spine at each of the posterior angles, the surface smooth. Telson little less than twice as wide as medial length, convex above and below; dorsum with an oblique fovea on each side near anterior margin, and with an almost indiscernible, obsolete median carina, the hinder end of which is bluntly, conically, slightly produced and overhangs the posterior margin of telson; termination of carina with a blunt, conical spinule, directed downwards and a little outwards. Hinder margin medianly incised, with, on each side, a strong lateral spine, a smaller intermediate, and a

slender, upcurved, movable submedian spine; next to the base of the lateral tooth is a small incision in which is a spinule; a row of four spinules between the lateral and submedian teeth and six slender spinules between the latter and the median incision, the last being minute. Peduncular segment of uropods with a carina on outer margin and another on dorsum, the last terminating distally in a spine; the two carinae are subparallel; the inferior process consists of two long, curved tricarinate spines, the inner of which is distinctly longer than the outer.

Colour in spirit yellow, with a few large black chromatophores on upper-surface, appendages of head, and raptorial merus and carpus. Rostrum and lateral unattached portions of carapace with additional white-ringed ocelli.

Length, 42.5 mm. Carapace: width at anterior and posterior margins approximately 5.2 mm.; greatest width, 7 mm.

*Hab.* Robe, South Australia (dredged by Sir Joseph Verco). (South Aust. Mus., Reg. No. C. 185.)

**LYSIOSQUILLA VERCOI var. OSCULANS var. nov.**

Plate xxxiii, fig. 3, and text fig. 384.

♀ Rostrum subrectangular, lateral margins subparallel, anterior margin medianly acuminate produced. Carapace convex from side to side, posteriorly strongly so; lateral margins convex, a little convergent anteriorly; posterior

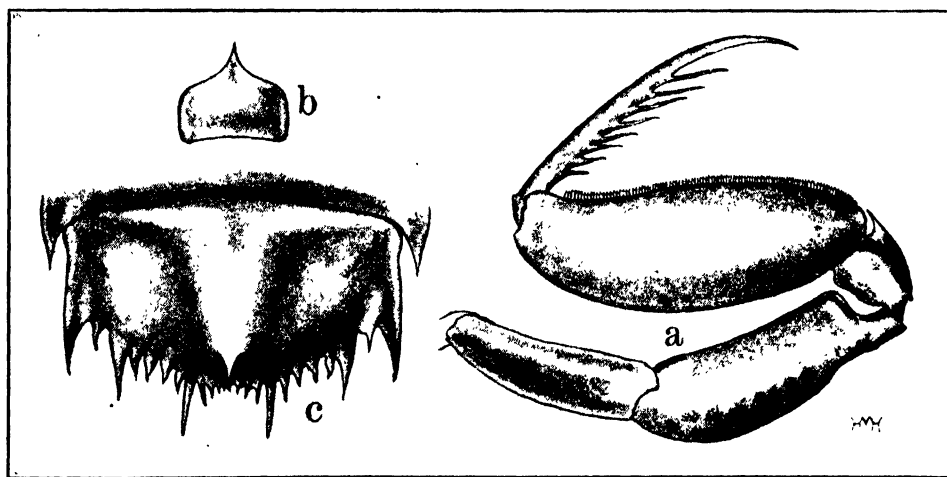


Fig. 384. *Lysiosquilla vercoi* var. *osculans*. a, Raptorial limb; b, rostrum; c, telson.

margin deeply concave. Inferior outer edge of ischium of raptorial limbs terminating distally in a forwardly directed spine; a second carina, a little distant from and subparallel to the first terminates on a lobular process overmovable spines, that of right propodus with four spines; dactylus slender, taper-

hanging the merus; propodus with inner margin a little sinuate, edged with fine pectinations; inner side of left propodus with six movable spines, that of right propodus with four spines; dactylus slender, tapering, armed with nine teeth, including the largest terminal one. Posterior margins of exposed thoracic somites subtruncate; lateral margins of fifth to seventh somites slightly convergent anteriorly, of eighth divergent; sixth and seventh somites postero-laterally right-angular, rounded. Sixth abdominal somite with a lateral spine on each side. Telson less than twice as wide as medial length, convex above and below, obscurely medianly tumid, the tumidity terminating in advance of the posterior margin of telson and produced into a flat, backwardly directed spine; hind margin a little medianly incised with, on each side, a strong lateral and intermediate tooth, and a more slender, movable, upturned submedian spine, the three subequal in length; a spine between the lateral and intermediate teeth about half as high as the latter; four similar spines between the intermediate and movable submedian teeth; four submedian denticles, decreasing in size inwards, the last very minute. Terminal spine of dorsal carina of peduncular segment of uropods directed obliquely inwards. The two long, tricarinate inferior spines are subequal in length.

Colour in spirit yellow, with black stellate chromatophores on upper-surface and on parts of appendages of head, in parts massed to form a very obscure pattern, as shown in the figure. A prominent black anterior spot on each side of carapace, touching inner margins of gastric grooves.

Length, 34 mm. Carapace: width at anterior and posterior margins approximately 4 mm.; greatest width, 5.6 mm.

*Hab.* South Australia. (South Aust. Mus., Reg. No. C. 186.)

This variety may be separated by the different form of the rostrum, by the lesser number of spines on the raptorial dactylus, by the armature of uropods and telson, etc. Unfortunately, the types of both forms are unique, and as they are closely allied it seems preferable to regard the last described specimen as a variety, at least until more material is acquired.

#### Explanation of Plate xxxii.

Fig. 1. *Squilla miles*.

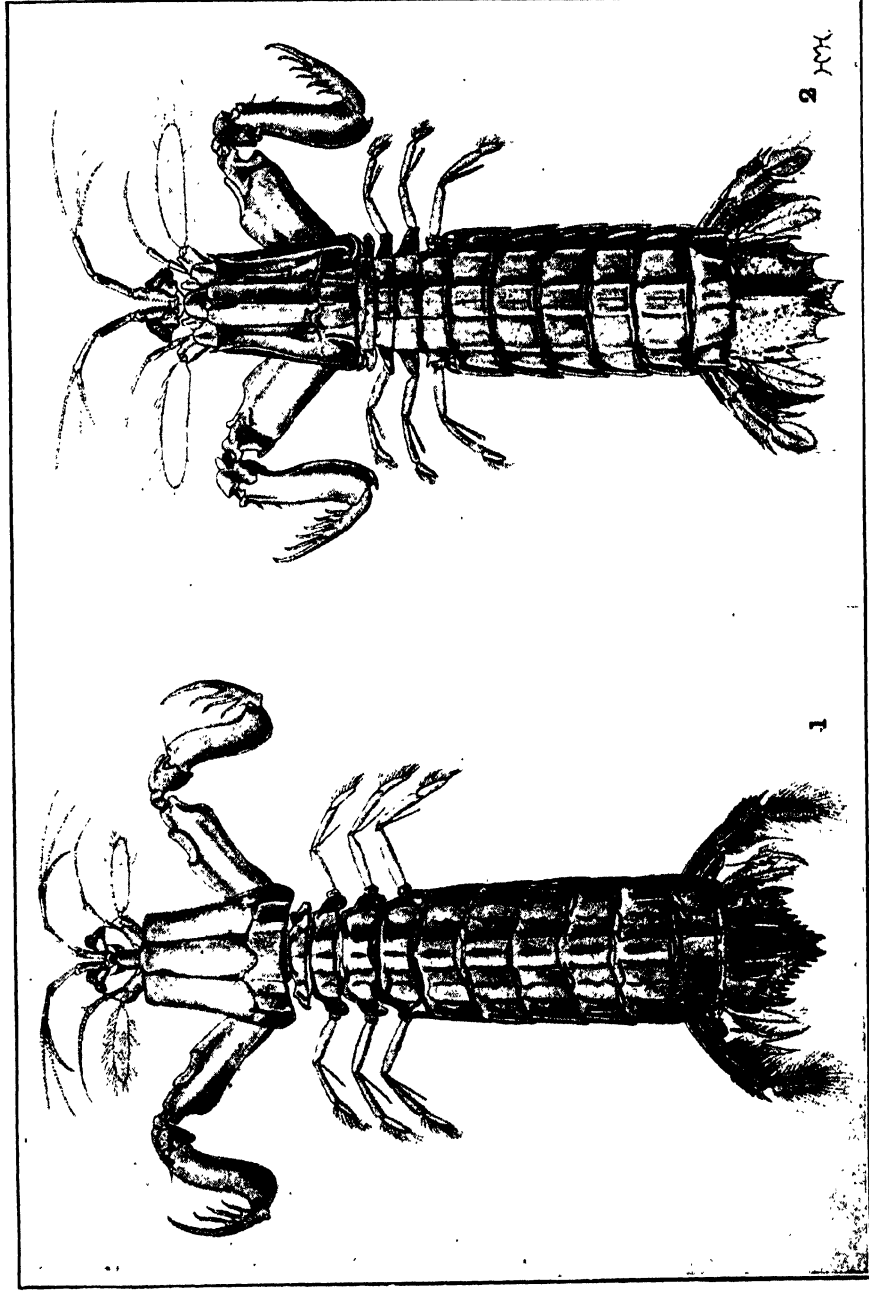
Fig. 2. *Squilla laevis*.

#### Explanation of Plate xxxiii.

Fig. 1. *Lysiosquilla perpasta*.

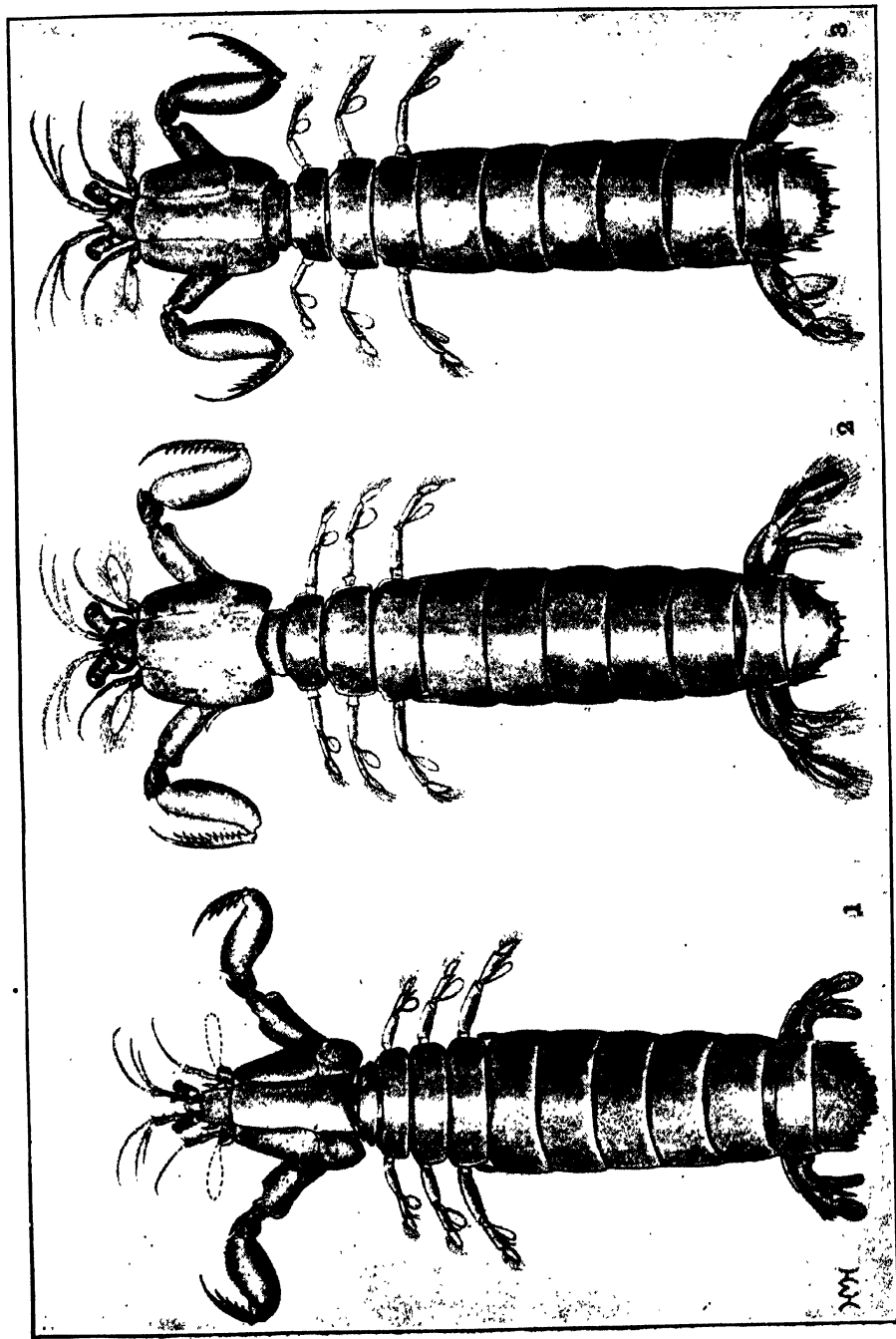
Fig. 2. *Lysiosquilla vercoi*.

Fig. 3. *Lysiosquilla vercoi* var. *osculans*.



MANTIS SHRIMPS.





MANTIS SHRIMPS.



# STUDIES IN AUSTRALIAN AQUATIC HEMIPTERA.

NO. III.

BY HERBERT M. HALE, SOUTH AUSTRALIAN MUSEUM.

## FAMILY NEPIDAE.

Plates xxxiv-xxxvi and text figs. 385-386.

A STRANGE variety of form is exhibited in the genera of this family, but in all representatives the abdomen of the adult is provided with a pair of terminal filiform appendages, the inner side of each of which is longitudinally grooved. When these appendages are closely adpressed, the channels, which are edged with fine hairs, together form a tube through which respiration is effected. When the bugs are submerged, the tip of this caudal tube is pushed through the surface film and so establishes communication with the external air.

**Habits.** The second and third pairs of legs are ill-adapted for swimming, and the bugs are sluggish in habit; inconspicuous colouration and a resemblance to natural surroundings enable them to obtain a good food supply with the minimum of effort. The anterior legs are markedly raptorial, the tibia and single-jointed tarsus folding back along the femur. The Nepids are extremely voracious and are usually found clinging motionless to weeds or debris near the surface, with the anterior legs extended in readiness to grasp any small animal passing near. The head is small but fairly prominent, with the rostrum short, stout, and three-jointed. Popularly the bugs are known by the not very appropriate name of "Water Scorpions." Apparently they hibernate beneath the water during the winter. Examples collected in the spring are commonly coated with mud, and quite often have the algae *Cladophora* and *Spirogyra* attached to the integument. The encrustation of mud is at times so marked as to suggest that the bugs have been buried at the bottom of the pools; during the period of inactivity, however, they could become so covered by sedimentary deposition from the winter flood waters.

Three genera are represented in Australia, one of which has not hitherto been recorded from the Australasian Region. They may be distinguished as follows:

- a. Medial length of pronotum much less than its greatest width, and breadth at anterior margin much greater than that of head. Anterior legs with coxae short, and femora as long as, or little longer than, tibiae and tarsi together . . . . . *Laccotrephes*



aa. Pronotum much longer than wide. Anterior legs with coxae long and femora at least nearly twice as long as tibiae and tarsi together.

b. Pronotum depressed, anteriorly as wide as, or slightly wider than, head. Form elongately oval. Legs moderately slender . . . . . *Curicta*

bb. Pronotum subcylindrical, anteriorly narrower than head, including eyes. Form linear. Legs very slender . . . . . *Ranatra*

### LACCOTREPES Stal.

*Laccotrepes* Stal, Hem. Afr., iii, 1865, p. 186 and Hem. Fabr., i, 1868, p. 134.

*Nepa* Ferrari, Ann. Hofmus., Wien, iii, 1888, p. 163 (part).

Type, *L. atra* Linnaeus.

Body much depressed, flattened. Pronotum rugose, the anterior margin excavated to receive the small head, and the posterior margin deeply concave in front of scutellum. Anterior femora stout, armed with a more or less distinct tooth near base.

### LACCOTREPES TRISTIS Stal.

*Nepa tristis* Stal, Öfv. K. V. Ak. Förh., xi, 1854, p. 241 and Eug. resa. Ins., iii, 1850, p. 266; Skuse, Rec. Aust. Mus., ii, 1893, p. 43; Ferrari, Ann. Hofmus., Wien, iii, 1888, p. 186; Tryon, Ann. Qld. Mus., ii, 1893, p. 24.

*Laccotrepes tristis* Bergroth, Proc. Roy. Soc. Viet., xxix, 1916, p. 39.

Plate xxxiv, fig. 1-3; plate xxxv, fig. 2, 4 and 6; plate xxxvi, fig. 18.

Colour: Dull black or blackish brown above and below. Legs more or less distinctly mottled, or irregularly barred with slightly lighter colour. A testaceous triangular marking sometimes present on each side of mesosternum, close to the acetabula. Membrane of alae brown, the nervures dark brown. Upper-surface of abdomen, where covered by wings, bright scarlet in life, sometimes fading to reddish ochraceous in cabinet specimens.

♂ Head well produced in front of the shining black eyes and with a roughened carinate elevation on notocephalon; genae very rugose, tylus prominent; width between anterior angles of eyes about half the widest interocular space between the inner posterior angles of the eyes. Pronotum twice as wide between prominent humeral angles as medianly long; very rugose, the coarse carinae and tumidities with small, roughened, and irregular tubercles, some of which may bear a bunch of short, stout hairs. Scutellum very slightly longer than wide,

coarsely, horizontally rastrate anteriorly; carinae in the form of Neptune's trident, with the three prongs anteriorly directed; the outer longitudinal carinae are always united posteriorly by a short horizontal carina, but the middle ridge is sometimes obsolete, sometimes well marked; carinae thickly clustered with similar tubercles to those described for pronotum. Hemelytra comparatively smooth, but with feeble tubercles on clavus and towards outer margin of corium. Anterior femora one and one-third times as long as tibiae, which are four and one-half times as long as the tarsi; proximal end of inner margin of femoral groove with a blunt spine, varying in length, never very large and sometimes entirely absent. Intermediate tibiae twice as long as tarsi and slightly more than half as long as posterior tibiae, which are three times as long as posterior tarsi.

Length, 26 mm. to 32 mm.; greatest width of pronotum, 7.9 mm. to 9 mm.; caudal appendages, 30 mm. to 35 mm.

♀ More robust than the male. Posterior width of pronotum relatively slightly greater, making the lateral margins more convergent. Abdomen a little more widened on posterior half, where it is about one-sixth wider than immediately behind the pronotum, whereas in the male it is but one-ninth wider.

Length, 41 mm. to 35.5 mm.; greatest width of pronotum, 9 mm. to 10 mm.; caudal appendages, 26 mm. to 33 mm.

*Hab.* South Australia: River Torrens (H. M. Hale); Mount Lofty Ranges (McEwin, McGrath, J. G. O. Tepper, etc.), Murray River (Bednall), Blanchetown (E. J. Lines), Melrose (B. B. Beck), "N.W. of S. Aust." (Dr. Basedow); Central Australia: Bagot's Creek, Alice Springs (Horn Expedition, *vide* Bergroth), Hermannsburg (H. J. Hillier); Northern Territory: Roper River (N. B. Tindale), Darwin (G. F. Hill); Queensland: Bellvue (Stirtridge), Cumnamulla (H. Hardeastle), Mackay (W. W. Froggatt); New South Wales: Waterloo Swamps (Skuse), Brewarrina (W. W. Froggatt), Clarence River (A. M. Lea), Dubbo; Victoria: Wangaratta (Simson); Western Australia: Benn River, E. Kimberley (Helms); North-Western Australia: Forrest River (W. Crawshaw); New Guinea: St. Joseph River (*vide* Tryon).

In recording this species from New Guinea, Tryon remarks, "the sides of the abdomen are unusually convex, giving this part of the body a widened appearance." The single specimen obtained was evidently a female.

*Biology.* I have never taken this species in other than weedy situations and in slowly-moving or stagnant waters. The fissures and tubercles of the pronotum seem particularly adapted for the retention of algal spores and other siftings from the weeds wherein the bug lurks. Tufts of *Cladophora* are sometimes attached to various parts of the insect, rendering it quite indistinguishable in the water; a specimen is shown with a tuft growing from the caudal appendages. (Pl. xxxv, fig. 4.) A few notes on behaviour in aquaria are appended.

When the end of a glass rod was moved about in the water near a motionless bug it responded to the movement, a deflexion of the raptorial limbs showing it to suspect the approach of some possibly edible animal. If the same object were brought within reach, the bug seized it, but soon relinquished its clasp after exploring the surface of the glass with the tip of the beak. When pushed from amongst weed the bugs usually paddled down to the bottom; on more than one occasion, however, examples apparently "played possum" to the extent of floating horizontally and without movement just below the surface film, with the legs irregularly arranged—perhaps with one anterior leg flexed and the other extended—not at all as in the more usual attitude; after remaining undisturbed for a time the insects would be found again clinging to the plants.

It has been pointed out that the allied *Nepae* bear some resemblance to a dead and waterlogged leaf. The same certainly applies to our species when in the peculiar attitude mentioned above.

Neither copulation nor oviposition was witnessed, but eggs were removed from the bodies of several gravid females. The largest number of ova contained by one individual was thirty-four; several of these are shown on Pl. xxxv, fig. 6, and Pl. xxxvi, fig. 18.

*The egg* (as removed from body of female). Colour whitish, excepting for a small, dark-brown, raised area near one end.

Oval, somewhat less curved on one side, and with from eight to ten filaments arranged in circular formation on one end; the opposite end is slightly more sharply rounded. The appendages are slender, about as long as the egg is wide, apically bluntly rounded and a little dilated; the surface is very finely granular, with the terminal portion for a distance of about  $\cdot 425$  mm. enveloped in more opaque chorion than the remainder of the filament. The surface of the egg shell is granular, with distinct and rather large raised hexagonal reticulations. On one side, near the end opposite to that bearing the filaments, is a transverse area  $\cdot 29$  mm. in length and raised about  $\cdot 1$  mm. above the surrounding chorion.

Length,  $3\cdot 25$  mm.; greatest width,  $1\cdot 425$  mm.; filaments,  $1\cdot 4$  mm. to  $1\cdot 5$  mm.

In such of the nymphs as I have had opportunity of examining, the colour is entirely greyish black or dark brown. The following description is made from a small series of fifth instar nymphs:

Head with tylus and genae much less prominent than in imago, and with the notocephalon wider and inner margins of the eyes rather less convergent. Pronotum more than twice as wide on posterior margin as medianly long; deeply incised anteriorly to receive head; hinder margin sub-truncate, a little convex. Wing pads extending to middle of length of lateral edges of second abdominal segment. Legs much as in the adult, and with the joints of about the same relative proportions.

♂ Length, 21 mm.; basal width of pronotum, 6·7 mm.; greatest width of abdomen, 8·2 mm.; caudal appendage, 10·5 mm.

♀ Length, 21 mm. to 23 mm.; basal width of pronotum, 6·9 mm. to 8 mm.; greatest width of abdomen, 9·1 mm. to 10 mm.; caudal appendages, 11 mm. to 14 mm.

### LACCOTREPHEs RUBER Linnaeus.

*Nepa rubra* Linn., Mus. Lud. Ulr., 1764, p. 165; Walker, Brit. Mus. Cat. Hemip., 1873, p. 187.

*Nepa grossa* Fabr., Ent. Syst., iv, 1794, p. 62.

*Nepa flavovenosa* Dohrn, Stett. ent. Zeit., xxi, 1860, p. 409.

*Laccotrephe s ruber* Stal, Hem. Fabr., i, 1868, p. 135; Dist., Faun. Brit. Ind., iii, 1906, p. 18 (syn.).

*Laccotrephe s japonensis* Scott, Ann. Mag. Nat. Hist. (4), xiv, 1874, p. 450.

*Nepa japonensis* Ferrari, Ann. Hofmus. Wien, iii, 1888, p. 175, taf. viii, fig. 4.

*Nepa eusoma*, *kohlii*, *dentata*, and (?) *dubia* Ferrari, loc. cit., pp. 179, 180, 181, 183, taf. viii, fig. 8, and taf. ix, fig. 15, 16, 20, 24, 29.

Plate xxxiv, fig. 4-5.

In the 1873 British Museum Catalogue (Walker) this species is listed as occurring in northern and north-eastern Australia. There is a possibility that the specimens then examined should be referred to *L. tristis*. In the insect collection of Mr. Wm. White, recently presented to the South Australian Museum, is an example labelled "Reed Beds, Torrens Riv., Sth. Aus., Jan. '61"; this specimen has the anterior femoral spine well developed, as in the example figured by Ferrari under the name of *N. japonensis*. Unfortunately, the locality labels of some of Mr. White's material are undoubtedly incorrect, so that this cannot be taken as an authentic record. As, however, the Oriental insect fauna somewhat overlaps that of north Australia, it seems advisable to figure the species, with a view to facilitating the possible verification of its occurrence in Australia. Therefore the specimen referred to, together with another from Pashoke, Sikkim, India, kindly forwarded by Dr. Annandale, is shown.

*Laccotrephe s ruber* is of much the same size and general facies as the preceding species. It may be distinguished by the more elongate form, the smaller and less prominent pronotal tubercles, and by the colour of the upper-surface of the abdomen, which is reddish-ochraceous with a blackish, longitudinal, median stripe, somewhat diffused and variable in width.

Length, 30 mm. to 35 mm.; greatest width of pronotum, 7 mm. to 9 mm.; caudal appendages, 35 mm. to 37 mm.

*Hab.* India, China, Japan, Formosa, (?) Australia.

**CURICTA Stal.**

*Curicta* Stal, Öfv. Vet. Ak. Förh., xviii, 1861, p. 202.

*Holotenthes* Berg, Hemipt. Argent., 1879, p. 194.

*Nepoidea* Montand., Ann. Soc. ent. Belg., xxxix, 1895, p. 476.

Type, *C. scorio* Stal.

As far as I am aware, the hitherto described species of this genus are confined to tropical America. The following species from tropical Australia, although more slender in form than *C. scorio* Stal, or *C. volxemi* Montandon (the only two representatives of which I have seen figures), approximates so closely to the genus that it could not well be placed elsewhere.

**CURICTA ANGUSTA sp. nov.**

Text fig. 385.

General colour dull brown or greyish-brown above and below. Surface somewhat rough. Head and pronotum irregularly and rather shallowly punctate. Clothed above with sparse, irregular brown hairs.

♂ Head, including eyes, slightly wider than the anterior margin of the pronotum; narrowest interocular space considerably more than the diameter of each of the subsphaerical eyes; a median, longitudinal carina, produced between eyes to form a prominent, blunt, conical tubercle, the anterior slope of which is a little steeper than the posterior; anterior portion of carina marked with a slight indentation in front of the interocular tubercle; genae coarsely and rugosely tumid, their thickened postero-lateral edges not quite reaching to the inner anterior angles of the eyes. Pronotum widest behind middle; medial length more than one and one-half times, and length between antero-lateral and postero-lateral angles about twice, the greatest width between humeral angles; medianly carinate on posterior two-thirds and with an elongate reniform swelling on each side, touching the carina posteriorly, but anteriorly diverging towards the acetabula; lateral edges and posterior angles tumid; anterior margin concavely incised, and posterior margin deeply angularly incised. Scutellum longer than wide. Hemelytra reaching to posterior margin of fifth abdominal segment; membrane rather small. Abdomen brownish above where covered by wings, darker on terminal segment, widest at about middle of its length. Caudal appendages missing. Underside of abdomen strongly keeled; connexivum longitudinally grooved. Anterior femora apically black, about one and three-fourths times as long as coxae; inner sulcation occupying two-thirds of the margin and having the proximal end roundly prominent inferiorly and above with an acute thorn-like spine; tibiae comparatively smooth, with two black bands on posterior half and a less prominent distal band. Apices of intermediate and posterior

femora, tibiae and tarsi black. Intermediate femora and tibiae subequal in length. Posterior tibiae one-fourth longer than femora.

Length (base of rostrum to termination of abdomen), 17·25 mm.; greatest width, 2·9 mm.

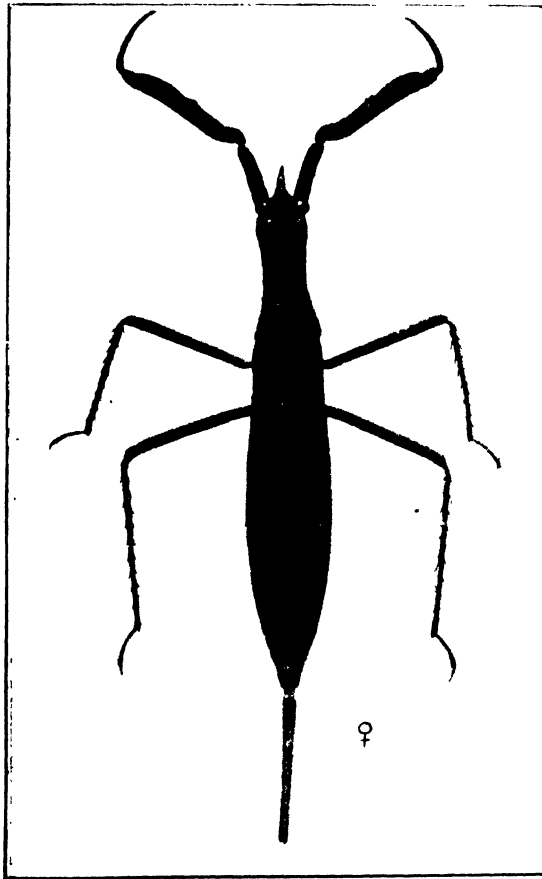


Fig. 385. *Curicta angusta*: enlarged 4 diams.

♀ A female, presumably from the mainland, is relatively a little wider and has the termination of the ventral keel less markedly prominent. The caudal appendages are stout, about one-half the length of the abdomen and rather more than one and one-half times as long as the pronotum.

Length (base of rostrum to termination of abdomen), 17 mm.; greatest width, 3 mm.; caudal appendages, 5·5 mm.

*Hab.* Northern Australia: Groote Eylandt, Gulf of Carpentaria (N. B. Tindale), "Northern Territory" (J. P. Tepper, 1875).

**RANATRA Fabricius.**

*Ranatra* Fabr., Syst. Rhyng., 1803, p. 108; Stal, Hem. Afr., iii, 1865, p. 189; Mayr, Reise Novara (Hem.), 1866, p. 189.

Type, *R. linearis* Linnaeus.

The members of this genus are easily recognized by the long, narrow form and attenuated legs. The anterior coxa is long and cylindrical; the femur is much longer, slightly curved, compressed, and furnished with one or two teeth a little anterior to the middle of the length of the inferior edge; the tibia and tarsus are comparatively short and fold back along the femur. In 1903 Bueno<sup>(1)</sup> described a stridulatory apparatus in an American species, *R. quadridentata* Stal; in this case sound is produced by the friction of a roughened area on the base of the anterior coxae against tiny ridges on the outer lobes of the prothorax. Previous to this, mention was made by Loey<sup>(2)</sup> of the stridulation of an American *Ranatra* by this method, but the name of the species discussed was not given.

In our State, boys know these insects as "Needle Bugs" or "Needles," and aver that they are sometimes stung by them when bathing in the creeks.

Only two species, one of which is new, may be definitely listed as occurring in Australia.

**RANATRA AUSTRALIENSIS sp. nov.**

Plate xxxiv, fig. 6-7; plate xxxv, fig. 1, 3 and 5; plate xxxvi, fig. 1-16.

♂ Head, including the rather prominent eyes, much wider than anterior margin of pronotum; notacephalon ochraceous or testaceous, about as wide as the diameter of an eye, slightly raised in the form of a large, very obtuse, low tubercle; genae tumid, punctate, with the inner edges convex and separated from tylus by a groove. Pronotum ochraceous or testaceous, darker on posterior third; lateral margins with a blackish streak on the whole length; medial length about two and one-half times the greatest width between humeral angles; slightly but distinctly constricted at the posterior third and with a longitudinal median carina. Scutellum ochraceous, more or less infuscated with black; medianly carinate anteriorly. Hemelytra brownish ochraceous, reaching to beyond middle of fifth abdominal segment. Legs ochraceous or testaceous; greater part of anterior coxae darkened, paler basally; femora apically blackish, with a pair of very obsolete subapical teeth on sulcated margin; a distinct triangular tooth on the inner edge of the lower margin at about the second third of the length, and a bluntly rounded, feeble lobe a little posterior to the tooth. Intermediate and posterior femora

(1) Bueno, Canad. Ent., xxxv, 1903, p. 235.

(2) Loey, Amer. Nat., xviii, 1884, p. 364.

black apically, and each with four or five black annuli; tibiae similarly but much less distinctly banded, apically black. Posterior femora reaching to middle of sixth abdominal segment. Caudal appendages as long as remainder of insect or considerably shorter. Underside ochraceous or testaceous. Prosternum bisulate longitudinally, with the median carina blackish. Mid-line of mesosternum slightly carinate, blackish. Metasternal process more or less darkened, in the form of a broadly subovate plate, coarsely tumid medianly, the summit foveate from the anterior margin of the process to beyond the middle of the length. Upper-surface of abdomen (where covered by wings) dull black in adult examples; connexivum ochraceous.

Length, 38 mm. to 44 mm.; caudal appendages, 32 mm. to 44 mm.

♀ Form more robust; interocular space a little wider. Legs slightly shorter, the posterior femora barely reaching beyond the posterior margin of the fifth abdominal segment. The ultimate ventral abdominal segment is markedly acuminate and extends under the base of caudal appendages as in *R. elongata* and *R. chinensis*. (Pl. xxxiv, fig. 7a.)

Length, 42.5 mm. to 50 mm.; caudal appendages, 31 mm. to 46 mm.

*Hab.* South Australia: Adelaide (type locality) and Mount Lofty Ranges (H. M. Hale and A. H. Elston), Lucindale (A. M. Lea), Encounter Bay (Dr. J. B. Cleland), Bordertown (J. G. O. Tepper); Queensland: Mackay (W. W. Froggatt); New South Wales: Grange (Blackmore), Gayndah (A. M. Lea), Tamworth (W. W. Froggatt); Victoria: Nyora (Searle); Tasmania: Launceston.

In a colour variety, the narrowed anterior two-thirds of the pronotum, the superior borders of the anterior coxae and femora, and of the respiratory filaments are bright castaneous.

The above large species, although common in Australia, does not appear to have been recorded. It is allied to *R. elongata* Fabr. I have compared the Australian specimens with several representatives of that species from various localities in India (including a female determined by Dr. Montandon), and find that they are readily distinguished by the following characters:

The eyes are smaller and less protruberant, the interocular space is a little wider, the pronotum relatively shorter, and the abdomen distinctly longer than in *R. elongata*. The second joint of the antenna is less produced laterally (Pl. xxxvi, fig. 16–17). The proportions of the legs are different. In the Indian species the anterior femora are about or slightly more than one and one-half times as long as the coxae, and have each a pair of small subapical teeth; when this limb is laid back along the body the apices of the femora reach to the middle of the third abdominal segment, while the coxae scarcely pass the posterior margin of the prosternum. In *R. australiensis*, on the other hand, the anterior femora are less than one and one-half times as long as the coxae, and reach back



beyond the posterior margin of the third abdominal segment, while the coxae extend considerably beyond the middle of the hinder edge of the prosternum. The caudal appendages are not longer than the rest of the insect, rarely are they as long; in a male *R. elongata*, 41 mm. in length, the filaments are 54 mm. long.

Through the courtesy of Mr. W. E. China, of the British Museum, I have also examined *R. chinensis* Mayr, which is of about the same length as our species, but is of very much stouter form, and differs so much structurally that no detailed comparison is necessary.

### BIOLOGY AND LIFE HISTORY OF *RANATRA AUSTRALIENSIS*.

In the summer of 1922 this Nepid was breeding in a small concrete dam in the Mount Lofty Ranges. The water was destitute of any large aquatic plant, but a little *Spirogyra* was attached to a floating log and, in places, to the walls of the dam. Great numbers of *Anisops hyperion*, *A. doris*, *Enithares bergrothi*, and the larvae of the large water beetle, *Cybister tripunctata*, were present in company with the *Ranatrae*; the majority of the bugs were in the nymphal stages. Considering the voracity of all these carnivorous insects and the uncompromising food situation, it is a matter for conjecture as to how the commissariat was balanced. Some notes were made concerning the habits of the *Ranatrae* in these surroundings, and later examples were maintained in aquaria for some months, during which time the satisfying of their gastronomic needs became a matter of some moment!

In the dam some nymphs and adults were clinging to the *Spirogyra* and to the floating log, but many were floating free in the water in the position shown in the photograph (Pl. xxxv, fig. 1). When disturbed, the bugs paddled obliquely downwards into the concealment afforded by the somewhat murky water; otherwise, excepting when feeding, they remained practically motionless, occasional slight movements of the raptorial fore legs alone being noticed.

*Parasites, etc.* A few examples were noticed floating just below the surface film, with the respiratory appendages in a horizontal position; an examination showed that in all so situated, a mass of *Spirogyra* attached to and growing from the base of the filaments, rendered these organs wholly non-functional by forcing them apart at the base (Pl. xxxv, fig. 3); notwithstanding this disability, the bugs appeared quite healthy. An analagous occurrence is recorded by Hungerford,<sup>(3)</sup> who figures the larva of an Hydrachnid parasite lodged between the caudal filaments of an American *Ranatra*. In our State epizoic Hydrachnids are attached to *Ranatrae* in greater number, and to a larger percentage of individuals, than in

(3) Hungerford, Bull. Univ. Kansas, xxi, 1919, p. 31, pl. xviii, fig. 10.

any other of the Cryptocerate bugs. In stagnant water the fungus *Saprolegnia* attacks and sometimes kills Nepids whose legs have been injured.

*Food.* The food consists of almost any small aquatic animal which passes within the grasping radius of the elongated anterior limbs. Examples in the dam mentioned above were observed to capture numbers of *Anisops* nymphs and an occasional crane fly which fell on the water. Quite commonly, both fore legs are utilized to hold two or three of the smaller insects simultaneously, even when a further example is impaled by the rostral setae and so held at the tip of the beak.

In aquaria, the same voracious habits were continued, the bugs feeding indiscriminately upon *Anisops* nymphs, blow flies, terrestrial Isopods, and larvae of dragon flies. In capturing prey, the flail-like raptorial limbs strike downwards with an action similar to that of the Praying Mantids. A captive is held against the underside of the femur by the tibia and tarsus, and the long coxae are folded back so that the food is brought to the beak, the tip of which explores the surface until a portion capable of being pierced by the setae is discovered; with nymphs of backswimmers the setae are inserted at the interstices of the segments.

*Copulation.* I have only once observed the act in an aquarium: the operation occurred at dusk. A female was clinging to weeds in the usual way, when a male approached and without preamble placed himself below and a little to the left and grasped her with the three legs of the right side. The anterior leg was inclined upwards and hooked over the pronotum of the female, while the intermediate and posterior legs grasped the abdomen in a similar manner. The female relinquished her hold of the weeds, floated to a horizontal position near the surface, and opened the acuminate genital opercle. The male maintained his position beneath the female, with the anterior part of his body inclined away towards the left, and the termination of the abdomen immediately below that of the female. The male genitalia were then extruded and curved upwards, passing between the caudal appendages, which were separated near the base for the purpose. The genital opercle of the female moved spasmodically until copula was effected. This female did not oviposit, but was later found to contain more than a score of eggs.

*Life cycle.* The bug passes through five nymphal stages before becoming adult. In the first and succeeding instars the nymphs assume the aggressive attitude characteristic of the *Ranatrae*; first instar nymphs captured and fed upon mosquito larvae in aquaria.

*Developmental changes.* The first instar nymphs examined are, in general, darker in colour than the others, but the head darkens as maturity is approached; the dark annuli of the femora of the second and third legs are distinct in all stages,

The head of the nymphs does not differ markedly from that of the adult; at first however, the tactile hairs of the rostrum are poorly developed, the notocephalon is wider, with the shallow gutters next to the inner margin of each of the eyes more distinct, the tumidities of the notocephalon, genae, etc., are less roughened, and the antennae are simple and very small. The tooth of the femur of the fore legs is absent in the first instar, but the inner margin of the inferior sulcus is rounded proximally and furnished with bristles, which are present on the summit of the tooth in each of the other stages, becoming relatively shorter as the tooth increases in size. (Pl. xxxvi, fig. 10 to 15.) Perhaps the most interesting feature is the evolution of the abdominal respiratory extension, which is not bifid until after the final ecdysis.

A detailed description of each stage is given below:

*The egg* (as removed from abdomen of female). Colour very pale yellowish, almost white; micropylar area dark brown; filiform processes pale amber, merging into ochraceous towards bases.

Elongate oval, four times longer than wide; outline in lateral view a very little concave on one side and apically obliquely subtruncate. Surface granular, with irregular hexagonal reticulations, which are particularly prominent distally. The micropyle is situated on the rounded edge of the slightly excavated apical end, from which arise two processes, each of which is two-thirds as long as the body of the ovum; with transmitted light, the core of these appendages is seen to be cylindrical, regularly tapering to apex; the surface, however, for the posterior two-thirds of the length is covered with a coarse, very irregularly hexagonal network; owing to these raised lines the outline under high power is far from smooth; terminal third enveloped in chorion of different character, very finely granular, a little dilated distally, and with six to seven apical nodules.

Length, 3.425 mm. to 3.55 mm.; greatest diameter, .84 mm. to .91 mm.; appendages, 2.225 mm. to 2.42 mm.

*First instar nymph.* Head ochraceous; base of beak with a dark-brown spot, the apical segment but little darkened; eyes black, the inner marginal gutters testaceous. Thorax and abdomen with a dark-brown median stripe above for whole length, laterally very pale ochraceous, excepting where the dark marking widens to margins; terminal appendage dark brown. Anterior coxae sooty; femora with two long faint annuli, the distal one more or less broken; tibiae sooty and tarsi transparent, excepting at apex. Intermediate and posterior femora pale ochraceous, with four brown annuli, the proximal rings indistinct; tibiae much less distinctly banded, apically blackish-brown; tarsi darkened on posterior half. Clothed above with rather sparse white hairs.

Head, exclusive of rostrum and including eyes, much broader than long; tumidities of notocephalon, tylus, and genae prominent, but less rugose than in

adult; eyes not as wide as notoccephalon, with only half the number of facets in a transverse series as in imago, each facet raised in the form of a granule. Rostrum three-jointed, the basal joint slightly constricted at base; the tactile hairs of the terminal segment are present, but are not well developed. Antennae very small, not darker than face, obscurely two-jointed. Thorax about one-fifth of the total length, with a slight median carina on whole length of dorsum. Pronotum widest anteriorly, where it is more than one-third wider than at the truncate posterior margin; medial length two and one-half times that of mesonotum; anterior margin more deeply incised, but less incrassate, than in imago. Mesonotum less than twice as long as metanotum, posterior margin truncate. Metathorax a little depressed laterally. A swelling near posterior angles of mesonotum and metanotum marks the origin of the undeveloped hemelytra and alae. Prosternum longitudinally, shallowly bisulcate. First dorsal segment of abdomen about as long as metanotum. The caudal respiratory appendage consists of a non-bifid elongation of the last dorsal segment of the abdomen, hinged, and to some extent movable perpendicularly, but not laterally. Seen from above, this extension is obscurely medianly carinate, three times longer than broad, and tapers to a blunt apex. Below the edges are curvedly inflexed and thickly fringed with rather long hairs; although these margins of the appendage are well separated, the fringes meet medianly to complete the breathing tube. Venter of abdomen  $\wedge$ -shaped in section as in adult, medianly ridged; lateral edges of segments inflexed, half roofing over the gutter on each side of venter (see Pl. xxxvi, fig. 7 and 8); a thick fringe of hairs emanating from the edges of these inflexions extends to the median keel, thus forming a closed canal on each side. The free "genital opercle" or "ventral plate" is not developed. The sulcation of the anterior femora is present, the groove fringed with fine hairs; the tooth is not developed, but is represented by a low, flat extension of the inner margin where the tarsus folds over the thigh; this elevation is furnished with apical bristles; the obsolete subapical teeth of the adult are absent, but are indicated by an almost imperceptible undulation of the margin. Posterior and intermediate legs provided with numerous feeble spinules, which are longest on the tarsi; tibiae and tarsi with a few long, thin swimming hairs, thirty to forty in a longitudinal series on the tibiae; tibiae and tarsi not apically dilated, the claws of the latter subequal, about one-fifth the length of the tarsi; posterior femora reaching back to middle of penultimate abdominal segment.

Length (exclusive of rostrum), 8.3 mm.; greatest width, .87 mm.; caudal appendage, 1.6 mm.

*Second instar nymph.* Head testaceous. General markings as in first instar, but with brown of dorsum much fainter, excepting for a darker sublateral streak

on each side of the anterior half of abdominal segments. Anterior tarsi apically brown. A broad, median, blackish-brown streak on sternum.

First segment of rostrum a little more constricted basally. Antennae two-jointed. Anterior margin of pronotum rather less deeply incised. Posterior margin of pronotum and mesonotum weakly concave; a slight convexity in the middle of the hinder margin of the last-named segment indicates the first sign of the development of the scutellum. Respiratory appendage longer and more slender, the inflexed edges closer together and with the fringe of hairs much shorter. A rudimentary genital opercle is apparent. Tooth of anterior femur now distinct, projecting beyond the inner margin, capped with bristles, which are, however, relatively shorter than before; the angularity on the opposite side of the sulcus, and a little posterior to the tooth, is also quite distinct. Spinules of other legs longer; swimming hairs as before, but in greater number. Posterior femora extending very slightly beyond hinder margin of fourth abdominal segment.

Length, 13 mm. to 13.2 mm.; greatest width, 1.2 mm. to 1.34 mm.; caudal appendage, 3.05 mm. to 3.27 mm.

*Third instar nymph.* Colour a little darker than in second instar; the sub-lateral markings of the dorsum are prominent, partially enclosing a pale elongate area. Anterior coxae with a sooty streak below. Pubescence sparse and very short.

Form rather more linear. Antennae indistinctly three-jointed, the penultimate joint scarcely widened at apex. The wing pads have commenced to develop, but are small; those of the hemelytra extend to the level of the incisure of the metanotum, while the alar pads reach almost to the hinder margin of the first abdominal segment. Middle of posterior margin of mesonotum produced very slightly backwards somewhat angularly. Respiratory appendage again longer and thinner, the edges little separated below. Anterior femoral spine larger, so that when the tarsus is flexed over the femur the apex of the tooth is in line with the outer margin of the tarsus. Spinules and hairs of intermediate and posterior legs more developed; an additional row of tiny spinules on tibiae; tibiae a little dilated apically. Posterior femora extending distinctly beyond hinder margin of fourth abdominal segment.

Length, 17.2 mm. to 20 mm.; greatest width, 1.65 mm. to 1.9 mm.; caudal appendage, 5 mm. to 6.1 mm.

*Fourth instar nymph.* Colour little changed. The dark testaceous of the head is in decided contrast to the duller colour of the remainder of the bug.

Antennae three-jointed, the joints subequal in length; the second, seen sideways, is widened anteriorly, but the lateral lobe is not at all forwardly produced. Median angularity of posterior margin of mesonotum extending to

middle of length of metanotum. The hemelytral pads extend to beyond the level of the posterior margin of the first abdominal segment, the alal pads a little further. When the anterior tarsus is folded over the femur, the tooth of the latter is seen to be twice as high as the tarsus is broad; the femoral projection of the opposite margin of the sulcus, and the obsolete subapical teeth, are prominent. The spinules of the intermediate and posterior legs are stronger and in character more nearly approach those of the adult. Posterior femora extending almost to middle of fifth abdominal segment.

Length, 24.5 mm. to 30 mm.; greatest width, 2.24 mm. to 3.3 mm.; caudal appendage, 8.75 mm. to 10 mm.

*Fifth instar nymph.* The apex of the penultimate rostral joint and the distal half of the terminal joint blackish. Antennae pale ochraceous, darkening to testaceous towards close of instar. Colour otherwise as before.

The head and its appendages greatly resemble those of the adult; tactile hairs of apical joint of rostrum well developed; antennae three-jointed, the second joint less laterally expanded, and the terminal joint smaller and more acutely rounded at apex than in adult, and with the few tactile hairs of the inferior margin of the second and third segments shorter and more feeble. Pronotum where anteriorly dilated about as wide as at concave posterior margin; anterior margin incrassate. The hemelytral and alal pads extend to the middle of the length of the second abdominal segment. Between the wing pads, the angularly produced margin of the mesonotum (approximating to the scutellum) reaches almost to the incisure of the metanotum; with the delineating fissures extending anteriorly from its lateral angles, this part of the integument has much the same general outline of the scutellum of the imago. Only the middle third of the first abdominal segment is exposed, the lateral portions being covered by the wing pads. The respiratory appendage is about two-sevenths of the total length of the nymph, and is freely movable; it is still non-bifid, and the dorsal carina is distinct, with a shallow sulcus on each side of it; below the edges are nearly applied, the thick fringe of hairs strongly interlacing. Mesosternal tubercle subovate, almost smooth, tumid anteriorly, produced and acuminate posteriorly. Genital opercle of female acuminate, slender, to a slight extent free, not extending to base of respiratory tube. Portion of femoral tooth projecting beyond margin, two and one-half times as long as greatest width of tarsus; laterally and on the margin the tooth is armed with a greater number of tiny spinules, but the apical bristles are relatively shorter. Posterior femora reaching to, or almost to, middle of fifth abdominal segment. The nymphal females are of larger size and stouter form than the immature males.

Length, 39.5 mm. to 41.5 mm.; greatest width, 3.5 mm. to 4.3 mm.; respiratory appendage, 16 mm. to 18.1 mm.

*The imago.* Colour at first pale; the whole of pronotum and hemelytra pale ochraceous; upper-surface of abdomen (where covered) brownish, gradually darkening to deep, dull black, but leaving lateral margins ochraceous. In the living imago the anterior narrow portion of the pronotum is often pale ochraceous, the remainder of the upper-surface dark grey.

Flat femoral tooth three and one-half times as high as the tarsus is wide, smooth on the side against which the tarsus rests when flexed, but with posterior half of opposite surface covered with tiny, stout spinules. The apical spines are tiny, relatively smaller than in any of the nymphs, but the spines among the hairs on the elevation of the opposite margin of the femoral sulcus are relatively longer than before. The long respiratory extension is longitudinally divided dorsally, thus forming two filiform, grooved setae. The sixth dorsal abdominal segment is also split, forming two pieces which, with the ventral plate, enclose the base of the respiratory tube. The genital opercle is of very different shape in the two sexes. (Pl. xxxiv, fig. 6a, 7a.) Below, the lateral inflexions (in which are the large membrane-covered stigmata) are not hair fringed and are folded against the venter.

The so-called tubercle of the metasternum is not of normal shape in specimens pinned soon after attaining the imaginal form; in such examples the process may be subcordate or subcircular in outline, with the surface concave or convex, medianly smooth, or carinate, with the carina posteriorly globose or sulcate for whole length. Even when the integument has hardened and the mature colouration is apparent, this tubercle is a little variable *inter se*.

Length, 38 mm. to 50 mm.; greatest width, 3.6 mm. to 4.9 mm.; respiratory appendages, 31 mm. to 46 mm.

### **RANATRA LONGIPES Stal. .**

*Ranatra longipes* Stal, Öfv. Vet.-Akad. Förh., 1861, p. 203; Montand., Ann. Soc. Ent. Franc., lxxvi, 1907, p. 56.

*Ranatra longipes* var. *diminuta* Montand., *loc. cit.*, p. 57.

Plate xxxiv, fig. 8, and text fig. 386(a).

♂ Eyes a little wider than, or subequal to, the interocular space, prominent, seen from above a little wider than long; notoccephalon usually smoothly convex, somewhat elevated, without angular tubercle, but sometimes (as in some examples from Port Darwin) with a distinct obtuse median carina. Pronotum about half as long as the abdomen, the greatest width between humeral angles about as wide as head, or much narrower. Anterior femora one and one-half times as long as the coxae, which are always longer than the mid-line of the pronotum, more often subequal to, or even slightly longer than the greatest length of the pronotum.

Posterior femora reaching to the extremity of the abdomen, occasionally a little beyond it.

Colour variable. Some examples are dark brown above and on legs, with the underside ferrugineous. Others are much paler, with the intermediate and posterior tibiae ochraceous and marked with four obscure testaceous annuli. Upper-surface of abdomen, where covered by wings, reddish ochraceous to brown; connexivum ochraceous or testaceous.

Length (Australian specimens), 22 mm. to 23.5 mm.; caudal appendages, 20 mm.

♀ A little larger and stouter than the male. The posterior femora reach to the middle of the last abdominal segment, occasionally to the termination of the abdomen, as in the male. Genital opercle not acuminate produced under base of respiratory appendages.

Length, 23 mm. to 28 mm.; caudal appendages, 21 mm. to 25 mm.

*Hab.* India. Malay Pen. Java. Fiji Is. Borneo. China. Queensland: Rockhampton (A. M. Lea); Northern Australia: Port Darwin and Adelaide River (British Mus. Collection); Western Australia (British Mus. Collection); South-Eastern Australia (*vide* Montandon).

Montandon says that this species is easily recognized by the long legs. It is of much smaller size than *R. australiensis*, the genital opercle of the female is not

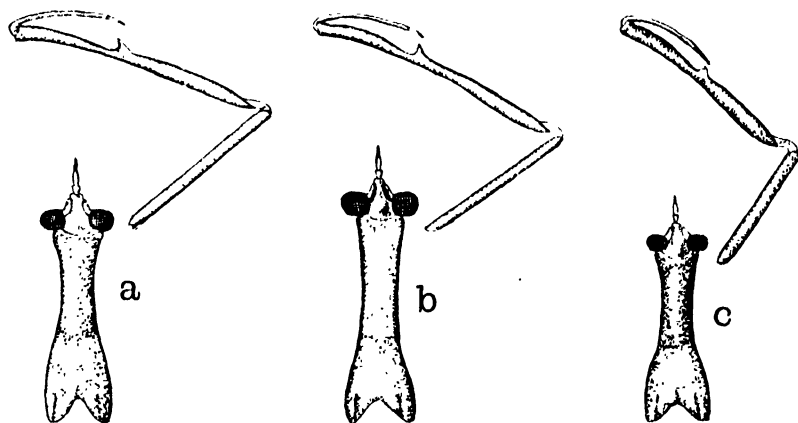


Fig. 386. a, *Ranatra longipes*; b, *R. filiformis*; c, *R. varipes*.

markedly acuminate produced, etc. The variety *diminuta* is described as differing from the typical form in having the pronotum subcylindrical, slightly and equally dilated behind and in front. Montandon remarks that this “*deformation*” is also found in *R. varipes*, and that examples so formed were designated *R. atropa* by him in 1903. In some male examples of *R. longipes* now examined, the pronotum is considerably less dilated behind than in others.



Two other species, *R. filiformis* Fabr. (4) and *R. varipes* Stal, (5) both allied to *R. longipes*, have been mentioned as occurring in Australia, but I have not seen specimens therefrom.

*R. filiformis* is of about the same size as *R. longipes*, but the notocephalon is slightly more elevated and the legs are relatively shorter; the anterior coxae are shorter than the mid-line of the pronotum and little longer than the prosternum ("coxae antice medio prostethii nonnihil longiores" [Stal]).

*R. varipes* is a still smaller species, none of the specimens I have seen exceeding 21 mm. in length, exclusive of the caudal appendages.

In fig. 386 the head, pronotum, and right anterior leg of the three last-named species are shown for comparison; b and c represent Indian specimens.

#### Explanation of Plate xxxiv.

- Fig. 1- 2. *Laccotrephes tristis*.  
 Fig. 3. Fifth instar nymph of *Laccotrephes tristis*.  
 Fig. 4- 5. *Laccotrephes ruber*.  
 Fig. 6- 7. *Ranatra australiensis*; 6a and 7a, genital plate of each sex; 6b, metasternal process.  
 Fig. 8. *Ranatra longipes*.

#### Explanation of Plate xxxv.

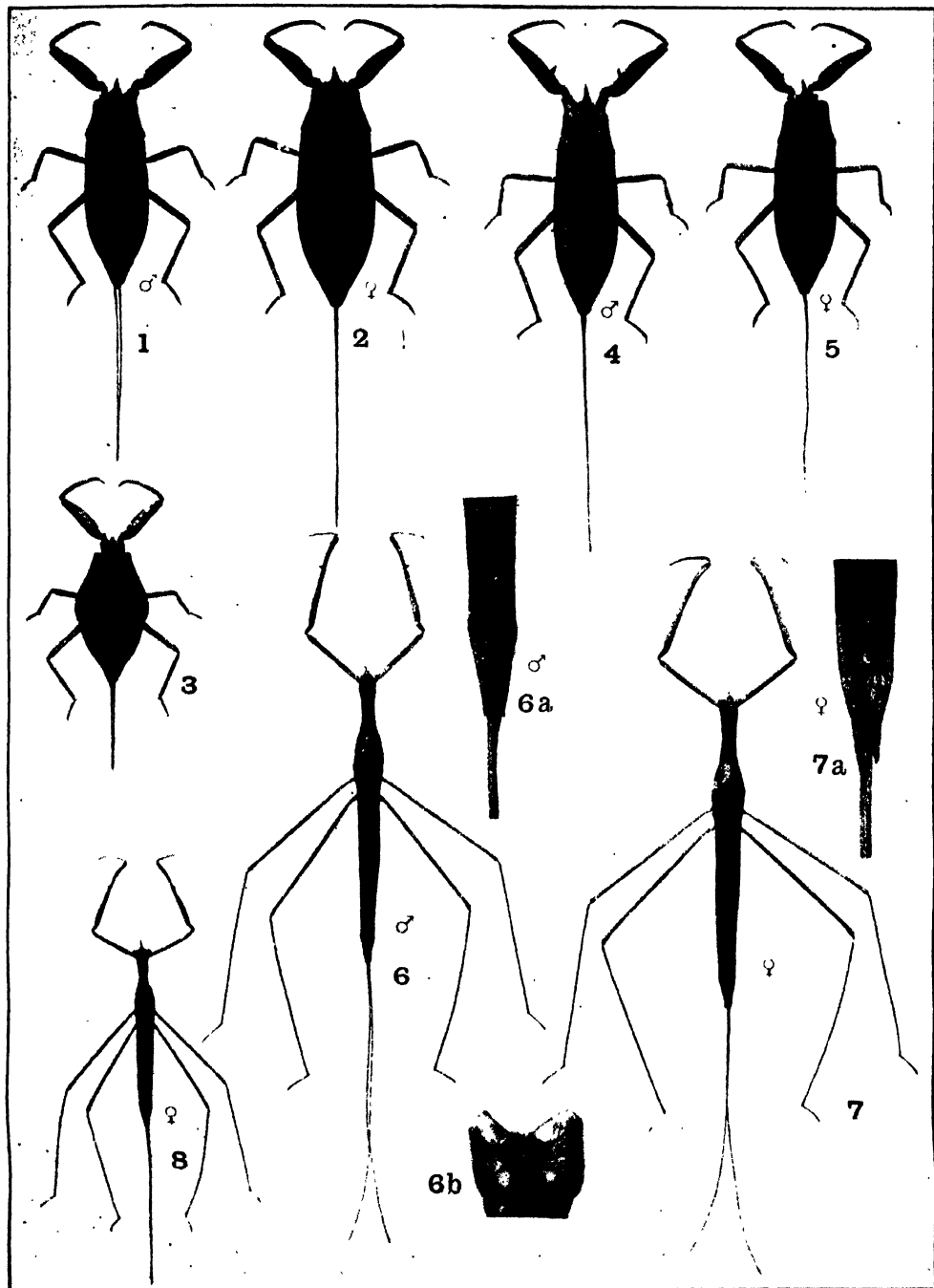
- Fig. 1. *Ranatra australiensis* in characteristic attitude.  
 Fig. 2. *Laccotrephes tristis* in the act of capturing a crustacean.  
 Fig. 3. Termination of abdomen of *Ranatra australiensis*, showing *Spirogyra* growing at the base of the caudal appendages and rendering the respiratory extension non-operative by forcing apart the usually adpressed filaments.  
 Fig. 4. *Laccotrephes tristis*, showing *Cladophora* attached to the caudal appendages.  
 Fig. 5. Eggs of *Ranatra australiensis*.  
 Fig. 6. Eggs of *Laccotrephes tristis*.

#### Explanation of Plate xxxvi.

- Fig. 1-16. *Ranatra australiensis*.  
 Fig. 1. Egg: 1a, one of the appendages further enlarged.  
 Fig. 2- 6. Dorsal views of the five nymphal instars.  
 Fig. 7. Ventral view of posterior portion of abdomen of first instar nymph, showing incurved lateral edges, etc.  
 Fig. 8. Section of abdomen of third instar nymph.  
 Fig. 9. Antenna of fifth instar nymph, showing the developing imaginal antenna as seen through the integument.  
 Fig. 10. Raptorial leg of first instar nymph; 10a, middle portion of the femur further enlarged; note absence of definite tooth.  
 Fig. 11-15. Development of femoral tooth from second instar nymph to imago.  
 Fig. 16. Antenna of imago.  
 Fig. 17. Antenna of *Ranatra elongata*, for comparison.  
 Fig. 18. Two views of egg of *Laccotrephes tristis*.

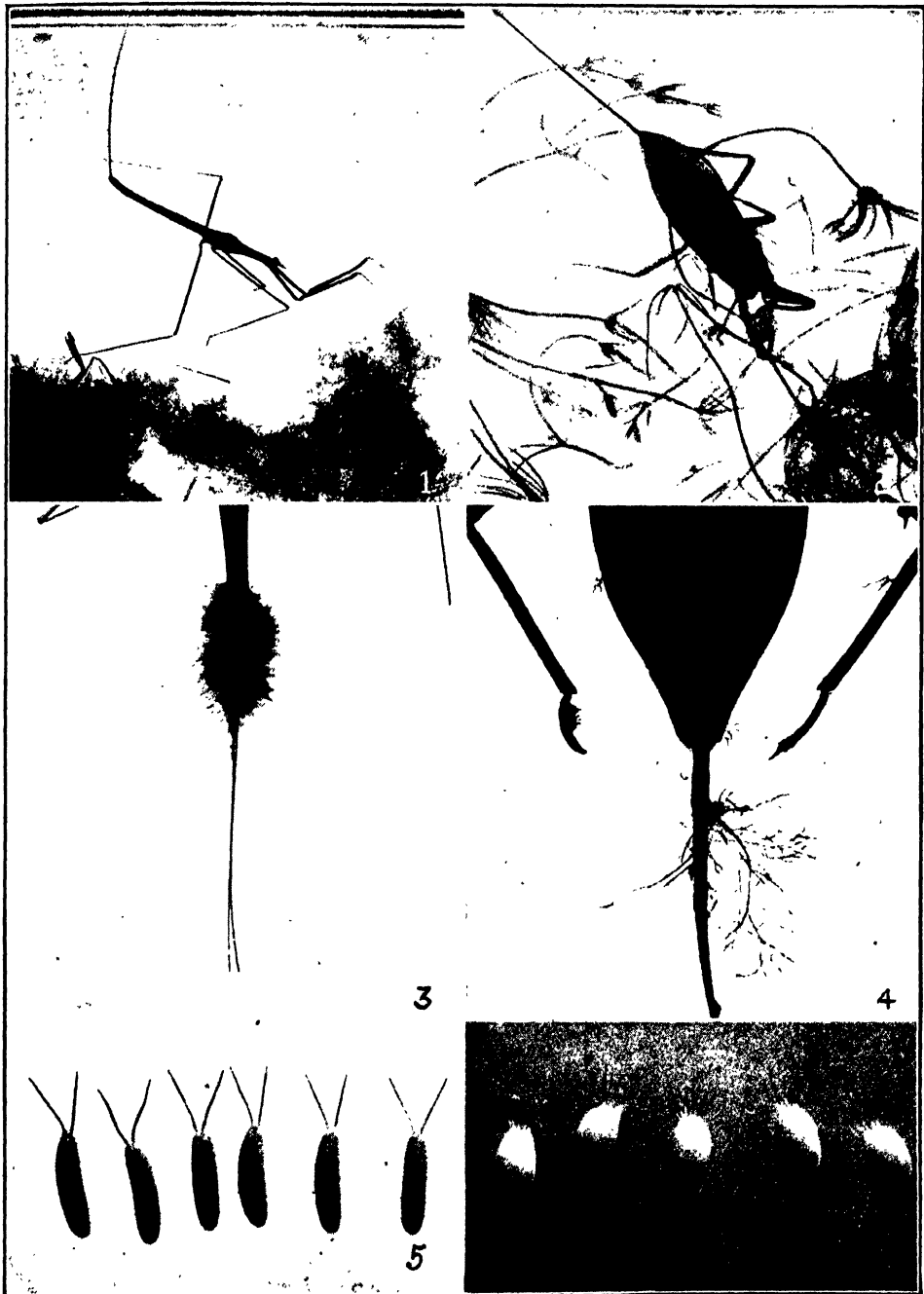
(4) See Walker, Cat. Hem.-Het. Brit. Mus., 1873, p. 190, and others.

(5) See Froggatt, Aust. Insects, 1907, p. 343.



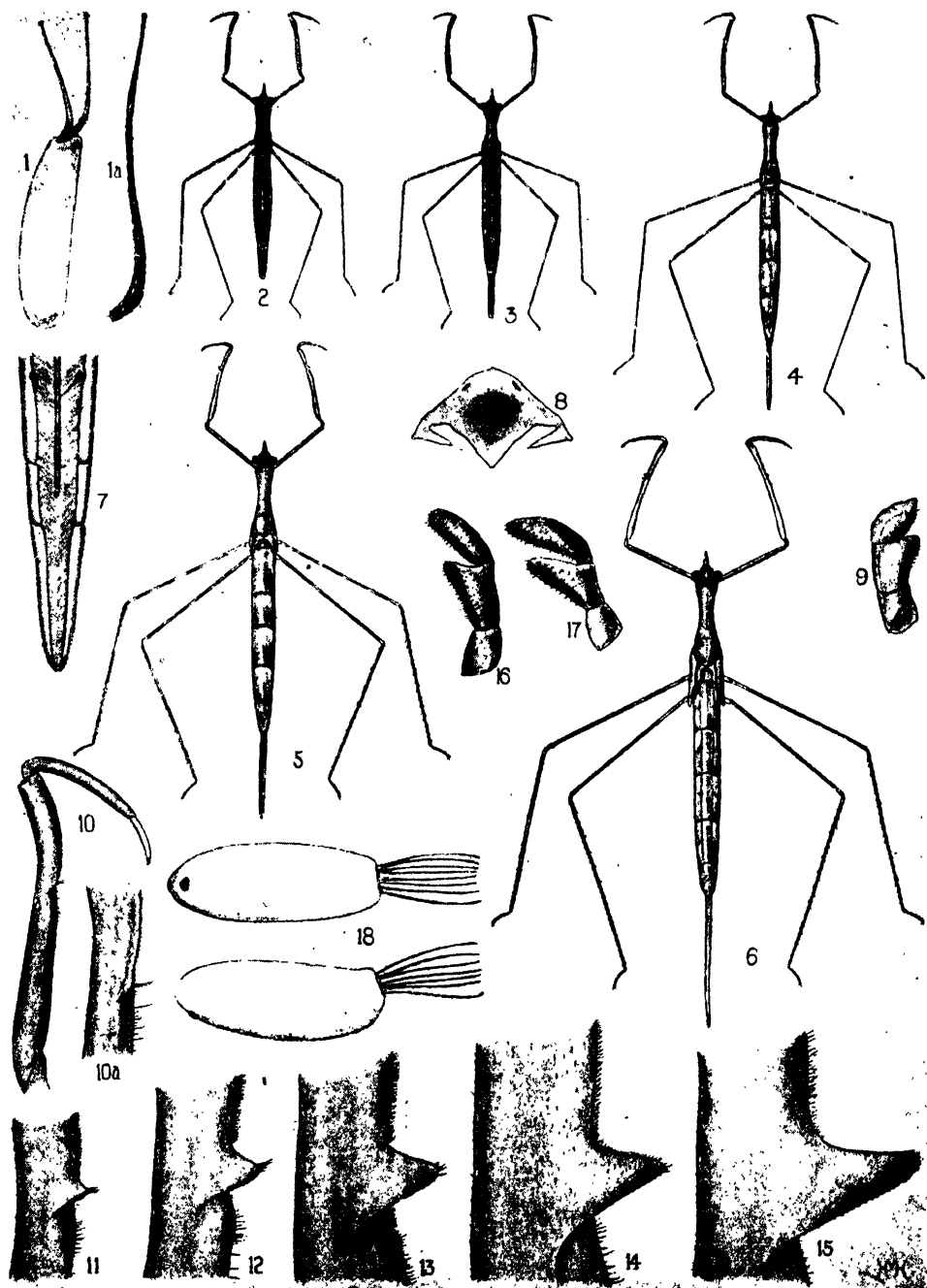
AUSTRALIAN AQUATIC BUGS.





AUSTRALIAN AQUATIC BUGS.





AUSTRALIAN AQUATIC BUGS.



# AQUATIC HEMIPTERA FROM GROOTE EYLANDT.

By HERBERT M. HALE, SOUTH AUSTRALIAN MUSEUM.

DURING a recent visit to Groote Eylandt, in the Gulf of Carpentaria, Mr. N. B. Tindale made a small collection of aquatic and semi-aquatic bugs. As none of these has been recorded from the island, a list of the species obtained is given below.

## FAMILY NEPIDAE.

**CURICTA** Stal, 1861.

**CURICTA ANGUSTA** Hale.

## FAMILY NOTONECTIDAE.

**ANISOPS** Spinola, 1837.

**ANISOPS FIEBERI** Kirkaldy.

**PLEA** Leach, 1817.

**PLEA BRUNNI** Kirkaldy.

## FAMILY CORIXIDAE.

**POROCORIXA** Hale, 1922.

**POROCORIXA PARVIPUNCTATA** Hale.

## FAMILY BELOSTOMATIDAE.

**SPHAERODEMA** Laporte, 1832.

**SPHAERODEMA RUSTICUM** Fabricius.

A dark variety of this variable species. Fuscous-brown above, with lateral and posterior margins of pronotum testaceous, and the embolium ochraceous; underside pitchy, in parts ferrugineous. The membrane is rather poorly developed, but the hemelytra are not otherwise stunted; the embolium is large, giving the insect a somewhat widened appearance.

**LETHOCERUS** Mayr, 1852.

**LETHOCERUS INDICUM** Le Pelletier & Serville.



## FAMILY HYDROMETRIDAE.

## SUB-FAMILY GERRINAE.

**GERRIS** Fabricius, 1794.

## SUB-GENUS LIMNOPORUS STAL.

**GERRIS AUSTRALIS** Skuse.**GERRIS EUPHRYSONE** Kirkaldy.

# ON AUSTRALIAN COLEOPTERA.

By ARTHUR M. LEA, F.E.S., ENTOMOLOGIST, S.A. MUSEUM.

## PART V.

### FAMILY CHRYSOMELIDAE.

Plates xxxvii-xxxviii.

#### PAROPSIS.

HAVING occasion to identify some island species of this genus, it appeared desirable to also describe some distinct mainland forms; this was the more easily possible as the South Australian Museum, possessing the majority of specimens seen by Blackburn, the many species of doubtful positions or great variability known to him, could be quickly compared and checked. A few notes on the groups he proposed are here given.

Group 1. The most natural of all the groups, but the species are mostly closely allied and variable; the colours usually alter after death, especially if the specimens have been preserved in alcohol.

Group 2. In Part 6 of the Revision,<sup>(1)</sup> Group 2 included Groups 2 and 5 of Part 1.<sup>(2)</sup> The species are usually very distinct, but the assemblage is not a natural one, depending mainly on the absence of seriate punctures.

Group 3. Elytra with numerous small elevations; the colour is usually dark-brown or blackish, and in life, specimens are covered with a more or less whitish meal; although Blackburn noted the seriate punctures as being in about twenty rows, the rows are so irregular, even when not much interfered with by the elevations, that it is difficult or impossible to count them; the species are usually variable, and it is difficult to apportion them into even the subgroups proposed by him.

Group 4. To this group Blackburn referred two very different sets of species; the first six species of his table are clothed with whitish meal when alive, and are like those of Group 3, except that the small elytral elevations are wanting; the others have the elytra with more or less irregular punctures, and usually ten fairly distinct series can be traced, the interstitial punctures are often large and obscure the rows; it is not always easy to distinguish them from Group 5.

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(1) Blackburn, Proc. Linn. Soc. N.S. Wales, 1901.

(2) *Loc. cit.*, 1896.

Group 5. This group, first noted as Group 5 in Part 6 of the Revision, is the Group 6 of former parts. The species have ten distinct rows of punctures on each elytron; six subgroups were noted, and in general are founded upon natural affinities. The species of Subgroup 5 will probably never be satisfactorily dealt with; in life they include some of our most beautiful beetles, frequently green or golden-green, with brilliantly metallic markings; shortly after death these disappear, and on the specimens drying they become more or less flavous or brownish, often with faint and variable infuscations. If the specimens are killed, and preserved in alcohol, the markings can usually be retained, although much of their brilliancy disappears; even after being dried the markings may sometimes be partially brought back by soaking the specimens for some hours in liquids. Baly suggested that some Australian naturalist might draw them in their natural colours, but even if such drawings were made it would be difficult to associate them with the names already published.

The markings of several groups do not alter on the specimens drying, although they are usually variable; hence some sketches of elytral markings may be of assistance. The accompanying sketches were made from a position perpendicular to the middle of each elytron, so that the submarginal markings could be better defined; as a result, the suture, instead of being shown as a straight line, appears as a curved one.

## GROUP 1.

### **PAROPSIS PONDEROSA** sp. nov.

Reddish-castaneous, sides slightly paler; under-surface, legs, palpi, and most of antennae deep shining black.

Head irregularly and somewhat coarsely punctate, clypeus with denser punctures than elsewhere. Prothorax about twice as wide as the median length, front angles strongly produced, sides irregularly sinuate, near sides widely depressed from base to apex and with dense and coarse punctures, elsewhere with somewhat sparser and smaller (but still fairly large) ones. Scutellum polished and impunctate. Elytra much wider than prothorax (at base about one-third wider), basal angles produced slightly downwards and rounded; with large, coarse punctures, frequently transversely confluent, especially about sides and apex; suture carinated on apical slope. Prosternum grooved along middle, except at apex. Length, 20 mm.

*Hab.* Queensland: Mount Tambourine (A. M. Lea). Type, I. 15516.

The largest known species of the genus. In Blackburn's table of Group 1<sup>(3)</sup>

(3) Blackburn, Proc. Linn. Soc. N.S. Wales, 1901, p. 165.

this species would be associated with *P. bella*, which has the prothorax much larger in proportion, and elytra with much denser punctures. The prothorax is not much larger than in *P. montana*, although its sides are very different; the elytra are, however, very much larger in proportion, the base of its prothorax being 9 mm.; the greatest width of the elytra, 15 mm.; parts of the elytra appear vermiculate. The type is a female.

**PAROPSIS BIVULNERATA sp. nov.**

Flavous, upper-surface with waxy or watery-looking mottlings, a reddish spot on each elytron about the middle near the suture; under-surface and legs somewhat reddish.

Head with a deep median line; punctures denser about eyes and on clypeus than elsewhere. Prothorax almost thrice as wide as the median length, front angles strongly produced, sides widest about apical fourth, thence strongly obliquely narrowed to base, and touching elytra at about one-third from sides, a shallow longitudinal depression marking off a wide space on each side from the convex disc; with minute and fairly large, irregularly distributed punctures, becoming very large on sides. Scutellum polished and impunctate. Elytra strongly convex and much wider than prothorax, basal angles produced downwards; punctures coarse, irregular, and more or less confluent near sides and apex, coarse, and in irregular rows (with irregularly elevated intervals) on apical slope; and smaller about basal half of suture than elsewhere. Prosternum, except at apex, acutely ridged on each side of a median depression. Length, 14-18 mm.

*Hab.* Northern Territory: Melville Island (W. D. Dodd), Batchelor, Stapleton (G. F. Hill). Type, I. 15517.

The colours as described are those of seven specimens from the island; when they were first seen in Adelaide there were two conspicuous and almost blood-red spots on the elytra, but these are now faded and rather obscure. A female from Batchelor is flavo-castaneous and without elytral spots; one from Stapleton is still darker (castaneous-brown), and also without elytral spots; both have the under-surface and legs dark blood-red. The species in Blackburn's table would probably be associated with *P. cerrea*, which is a much smaller and otherwise different insect. The subvermiculate elevations of the elytra themselves have sharply defined punctures of moderate size. The male is smaller than the female, and has the basal joint of the front tarsi larger, and the apical segment of abdomen transversely impressed.

## GROUP 2.

**PAROPSIS LATERALIS** Blackb., 1892.*P. conjungens* Blackb., 1896.

The type of *P. lateralis*, from the Elder Expedition, is in this Museum; it appears to have been completely overlooked by Blackburn when revising the genus, and in his collection was not represented by a label of any kind. It is the same as *P. conjungens*, a cotype of which (from the Horn Expedition) and a named specimen (from Wells' Expedition) are also in the Museum, and the three specimens agree perfectly.

**PAROPSIS ANOMALA** Blackb.

Plate xxxvii, fig. 1.

The sketch given is that of an ordinary elytron of this species.

**PAROPSIS NIGROSUTURALIS** sp. nov.

Pale castaneo-flavous, parts of under-surface and of legs somewhat darker, suture narrowly black throughout, from five to seven apical joints of antennae blackish.

Head shagreened and with irregularly distributed punctures, sharply defined but not very large, and denser near eyes than elsewhere; clypeal suture rather narrow and deep. Prothorax shagreened and subopaque; with small and sparse punctures towards sides, the sides themselves with large ones, sublateral foveae not traceable. Elytra wide and strongly convex, outlines (except at base) continuous with those of prothorax; sides with large and somewhat crowded punctures, elsewhere with fairly dense and sharply defined, but not very large ones. Middle of prosternum strongly ridged, distinctly grooved almost to apex. Abdomen with about eight small granules behind each hind coxa, or subdenticulate. Length, 8-9 mm.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15525.

An almost round species with the black suture of *P. abdominalis*, but smaller, under-surface not black, and prothorax opaque and impunctate in middle; *P. globulosa*, also with the suture black, is smaller, and with quite conspicuous punctures in the middle of the pronotum. *P. hemisphaerica* is smaller, with suture not dark, and *P. circe* is larger, with a spot on each shoulder; in Blackburn's table of Group 2, it would be associated with *P. mimula*, which is a smaller species, with pronotum shining and suture not black. The discal punctures of the elytra, owing to "waterlogging," appear to be much larger than they really are, from some directions three or four geminate rows may be traced on each elytron. Two specimens were obtained.

**PAROPSIS SUBAERARIA** sp. nov.

Black, highly polished; upper-surface with a faint greenish or bronzy gloss; labrum, antennae (apical half infuscated), and palpi flavous.

Head with crowded irregular punctures of three sizes: very minute (causing parts to appear faintly shagreened), of moderate size but sharply defined, and large sparse ones; the largest ones absent from clypeus. Prothorax more than four times as wide as its shortest length (immediately behind the eyes); with large and fairly numerous, but not crowded, punctures on sides, a few small ones near apex, elsewhere with scarcely visible ones; sublateral foveae vague. Elytra wide and strongly convex, outlines (except from obtuse notch on each side) sub-continuous with those of prothorax; with very minute punctures, the sides with numerous, but not crowded, large and deep ones, very few and smaller ones elsewhere. Middle of prosternum not grooved. Length, 11–15 mm.

*Hab.* Queensland: Somerset (C. French), Coen (J. A. Anderson). Type, I. 15518.

With the general appearance of *P. aeraria*, but less conspicuously metallic, and without distinct punctures in middle of pronotum, those on disc of elytra smaller and much sparser, etc.; on *P. aeraria* the coarse elytral punctures, although not crowded, are certainly numerous about the base adjacent to the scutellum, on the present species there are either very few large punctures adjacent to the scutellum or none at all. On the two largest specimens the median line of the head is obscurely reddish.

**PAROPSIS S-NOTATA** sp. nov.

Plate xxxvii, fig. 2.

Dark blood-red, under-surface somewhat paler, legs, antennae, and palpi still paler, elytra brownish-black, each with about eleven round or elliptic flavous or reddish spots.

Head with punctures of small and moderate sizes, larger and more numerous near eyes than elsewhere. Prothorax about thrice as wide as the median length; with fairly numerous and rather small but sharply defined punctures, becoming coarse on sides; sublateral foveae rather large. Elytra wide and strongly convex, outlines (except at immediate base) continuous with those of prothorax; sides with punctures as on sides of prothorax, elsewhere with small but sharply defined ones, somewhat as on disc of pronotum. Middle of prosternum grooved, except close to apex. Length, 7.5–8 mm.

*Hab.* Queensland: Kuranda (H. H. D. Griffith from F. P. Dodd). Type, I. 15524.

In Blackburn's table this species would be associated with *P. polyxo*, but it is slightly shorter and more convex, much darker and with fewer spots; that species (as noted by Blackburn) has a curious "washed-out" appearance, and the spots on the left elytron are not arranged to form an S; on the present species an S can be very readily made out, only two spots being redundant: one near the suture at the basal fourth, the other close to the apex; two spots near the suture at the summit of the apical slope are conjoined on two specimens, free on another, and on a fourth free on the left elytron but conjoined on the right. The elytral punctures are nowhere seriate in arrangement, except that some of the larger spots are margined with some slightly larger than the other discal ones, but the outlining of these spots is much less defined than on many of those of *P. anomala*. The antennae are entirely flavous.

**PAROPSIS NOVEMLINEATA** sp. nov.

Plate xxxvii, figs. 3 and 4.

Flavous, under-surface and legs more or less reddish, parts of sterna, knees, and tips of tibiae and apical half of antennae more or less infuscated, suture and four narrow lines on each elytron, and a small spot on each shoulder, black or blackish.

Head finely shagreened; with small and moderate-sized punctures, larger near eyes than elsewhere; clypeus more polished and with more crowded punctures than rest of head, its hind suture very conspicuous. Prothorax shagreened and with small and moderately large punctures, becoming larger and fairly dense on sides; sublateral foveae not traceable. Elytra wide and strongly convex, outlines, except at extreme base, continuous with those of prothorax; with large and rather dense punctures, in places having a sublineate appearance, the interspaces with sparse and minute punctures. Middle of prosternum strongly ridged on apical half, subtriangularly grooved on basal half. Length, 10-11 mm.

*Hab.* Queensland: Yulabilla (R. C. Beck), Dalby (Mrs. F. H. Hobler). Type, J. 15522.

Structurally fairly close to *P. tripuncticollis*, but with black stripes on the elytra, instead of whitish ones; in Blackburn's table it would be associated with *P. stali*, from the description of which the elytra differ in many respects. The middle of the base of the prothorax is very narrowly black; its disc (probably due to decomposition) is obscurely mottled; the suture of the elytra is narrowly black to the apex, but not quite to the base, the next two stripes are longer than the two outer ones, and two are conjoined, or almost so, towards the apex. One specimen has elytra of a rather pale brick-red colour, and this specimen also has the base of the head narrowly black. The elytral punctures are slightly larger,

but otherwise much as in *P. circe*; the base of the abdomen is denticulate immediately behind the hind coxae.

**PAROPSIS TRIMORPHA** sp. nov.

Form 1. Deep black and shining, part of median line of head, and margins of prothorax and of elytra, very narrowly flavous, or reddish-flavous, parts of five (or less) basal joints of antennae obscurely reddish.

Head with irregularly distributed and sharply defined but not very large punctures. Prothorax with rather small but sharply defined punctures in middle, becoming larger towards and coarse on sides; sublateral foveae not traceable. Scutellum with a few small but distinct punctures. Elytra wide and strongly convex, shoulders strongly rounded and sides not continuous with those of prothorax; punctures large, dense, and so frequently confluent that the surface appears vermiculate (less distinctly near the scutellum than elsewhere), the interspaces with a few punctures, suture carinated and punctate on apical slope. Prosternum narrowly impressed along the strongly elevated middle. Length, 8.5–10.5 mm.

*Hab.* Western Australia: Lennonville (Miss J. F. May), Cue (H. W. Brown). Type, I. 15520.

The outlines are somewhat as on *P. hemisphaerica*, and allied species, but the sculpture of the elytra is much as on many species of Group 1, from which the species is excluded by the even outlines of the prothorax. In Blackburn's table of Group 2, it would be placed in AAA, BB; from all the species placed there it is distinguished by the entirely deep black legs; *P. circumdata*, also with narrowly flavous margins, belongs to a different section of the genus.

Form 2. As Form 1, but with elytra (except that the suture is narrowly infuscated) entirely pale, and with vermiculation due to confluence of punctures less pronounced.

*Hab.* Carnarvon and Whitlock River (C. French), Yorkrakine (F. H. du Boulay).

Form 3. Elytra obscurely brownish, prothorax somewhat darker (but not black), its sides obscurely paler, head with median line only, or most of the front part as well, obscurely reddish; elytra sculptured as in Form 2; under-surface and legs as in Form 1.

*Hab.* North-Western Australia (Blackburn's Collection).

The three forms resemble each other so closely in structure and size that it is almost certain they belong to but one species, especially as the specimens were all from more or less adjacent localities. There are seven specimens of Form 1 before me, four of Form 2, and six of Form 3.



## GROUP 4.

**PAROPSIS EXCISIPENNIS Blackb.**

In commenting upon the position of this species, Blackburn made a curious error: he stated that it belonged to "Group iv (P.L. S.N. S.W. 1896, p. 643) Subgroup i." But Group iv, to which the species certainly belongs, was dealt with in 1897 (pp. 180-189) and was not divided into subgroups. In his collection a label representing the type (now in the British Museum) was placed after *P. coadnuta*, in Group 5 (formerly 6) Subgroup 4, where it was certainly out of place. The species, however, is remarkably distinct by the sculpture of the sides of the elytra; the type was described as having the elytra "*pone medium in disco indeterminate sanguineo-tinctis*." Of six specimens (from Donnybrook and the Vasse River) before me four have a wide, somewhat V-shaped sanguineous mark towards the base of the elytra, and an irregular blotch towards the apex (interrupted by impunctate pale intervals); one has no subbasal mark, but almost the whole of the apical slope rather deeply stained with red; the other specimen has a very vague stain only on each side of the summit of the apical slope. A seventh specimen (from Donnybrook) probably also belongs to the species, but has a round brown spot near the scutellum, a sublateral brown vitta extending from base to beyond the middle, and some more obscure marks. .

**PAROPSIS LACHESIS Stal.**

Plate xxxvii, figs. 5-7.

**PAROPSIS NIGROPICTA Chp.**

Plate xxxvii, fig. 8.

**PAROPSIS PULCHELLA Chp.**

Plate xxxvii, fig. 9.

**PAROPSIS TETRASPILOTA Chp.**

Plate xxxvii, fig. 10.

**PAROPSIS RUFOPICTA Blackb.**

Plate xxxvii, fig. 11.

**PAROPSIS QUADRINOTATA Blackb.**

Plate xxxvii, fig. 12.

Sketches of elytral patterns are given for comparison with those of other species.

**PAROPSIS HAEMATOSTICTA** sp. nov.

Plate xxxvii, fig. 13.

Black, shining, elytra with four large blood-red spots; labrum, antennae (tip infuscated), palpi, and parts of under-surface and of legs more or less reddish.

Head with rather dense and sharply defined but not very large punctures, becoming smaller and sparser in middle of base; clypeal suture obsolete. Prothorax about thrice as wide as the median length, hind angles not rounded off; punctures in middle about as large as on head, becoming larger and denser on sides, but not suddenly so, without sublateral foveae. Elytra not much wider than prothorax, the outlines not subcontinuous with those of that segment; with rather strong and confused punctures, in places somewhat seriate in arrangement, coarser on sides than elsewhere; suture carinated on apical slope. Middle of prosternum shallowly grooved along middle almost to apex. Length, 4 mm.

*Hab.* Queensland: Bunya Mountains (Mrs. F. H. Hobler). Type, I. 15535.

About the size of and structurally close to *P. tetraspilota*, but the spots on each elytron much larger and brighter, the basal one touching the scutellum at the base, and wide on the side, and the apical spot larger and of different shape. The antennae are almost flavous, except that from three to five of the apical joints are infuscated; on one specimen the tarsi, trochanters, parts of tibiae and of coxae, most of metasternum, apical segment of abdomen, and tip and sides of the preceding segment are more or less conspicuously red; on a second specimen only the tarsi (of the legs) are conspicuously reddish, and only the sides of the two apical segments of abdomen.

**PAROPSIS ISOLATA** sp. nov.

Plate xxxvii, fig. 14.

Black, four large spots on elytra, and most of under-surface flavous.

Head wide, with dense and rather strong punctures near eyes, becoming smaller and sparser in middle; clypeal suture obsolete. Prothorax about thrice as wide as the median length, basal angles not rounded off; with rather small but sharply defined punctures, becoming coarse on sides; without sublateral foveae. Elytra rather wide, base about one-fifth wider than base of prothorax; with moderately large punctures, more or less seriate in arrangement, and becoming rather coarse on sides, the interspaces with small but distinct ones. Middle of prosternum triangularly impressed on basal half only. Length, 4.25 mm.

*Hab.* New South Wales: Barraba (Dr. E. W. Ferguson). Type, I. 15536.

On each elytron a large, transverse, irregular spot occupies most of the basal third, the other spot is irregularly rounded and occupies rather more than the

median third, somewhat nearer the apex than it is to the basal spot; the front of the head, front margin of prothorax, and some obscure mottlings near its base, are of a dingy flavous; four basal joints of antennae and the palpi are also flavous. It is about the size of *P. tetraspilota*, but slightly wider and less convex, elytra with less numerous punctures, and the basal spots much larger; from the preceding species it also differs in being slightly less convex and with sparser elytral punctures, the large basal spots are also paler, and do not touch the scutellum, base, or sides. The seriate punctures on the elytra are hardly of sufficient regularity for the species to be referred to Subgroup 4 of Group 5.

**PAROPSIS MEDIOFLAVA** sp. nov.

Plate xxxvii, fig. 15.

Black; labrum, most of prothorax, a submedian fascia on elytra, sublateral spot and margins beyond the middle palpi and tarsi flavous.

Head wide, with fairly dense punctures of moderate size, becoming crowded near eyes; clypeal suture obsolete. Prothorax rather more than thrice as wide as the median length, hind angles not rounded off; with rather small but sharply defined punctures, becoming rather dense and large on sides; without sublateral foveae. Elytra at extreme base scarcely wider than prothorax; with numerous rows of punctures of moderate size, becoming larger on sides, interspaces with small but sharply defined ones. Middle of prosternum with a groove, narrow at apex and evenly dilated to base. Length, 5 mm.

*Hab.* Western Australia: Swan River (J. Clark). Type, I. 15529.

A briefly elliptic species; from directly above the outlines of the prothorax and elytra appear to be continuous. The "waterlogging" of the seriate punctures on the pale parts appears to indicate that there are but ten distinct rows on each elytron (and therefore that the species belongs to Group 5), but elsewhere this appearance is much less evident, and more numerous rows may be traced. The dark parts of the prothorax are a small spot towards each side at the basal third, and a median line traversed by an irregular median cloud; the pale submedian fascia on the elytra is of irregular shape, and is interrupted towards each side, it then appears as a spot joined to the margin, which is then narrowly flavous to apex; the antennae are infuscated throughout.

**PAROPSIS CARDINALIS** sp. nov.

Plate xxxvii, fig. 16.

Blood-red with black markings, sterna, abdomen and most of legs black, palpi and five basal joints of antennae reddish.

Head with dense and sharply defined punctures; clypeal suture not traceable in middle. Prothorax about thrice as wide as the median length; with sharply

defined punctures, small and of moderate size, becoming mixed with large ones on sides; without sublateral foveae. Elytra with numerous more or less irregular rows of large punctures, becoming coarse on sides, the interstices with small but sharply defined ones. Median ridge of prosternum with large punctures on basal half, but not distinctly grooved. Length, 4.5 mm.

*Hab.* New South Wales: Upper Clarence River (H. J. Carter). Type, I. 15533.

An elliptic, strongly convex species, about the size of, and with much the colours of, *Novius cardinalis*, of the Coccinellidae. The elytral markings are much as on *P. lachesis*, but the head is not widely flavous in front, and the elytra are more strongly punctate; on *lachesis* the prothorax is occasionally entirely black, but when black markings on a pale background are present they are always median, never basal; the pronotal markings are much as on *P. pulchella* and *P. didyma*, but the elytral ones are very different. The head is mostly black; on the prothorax there are four large basal spots, the outer ones almost square, the median ones subtriangular and conjoined at base; the scutellum and suture (the latter dilated at apex) are black; on each elytron there are four isolated black marks: a somewhat oblique spot at the base, two large round spots before the middle, and a large, somewhat V-shaped, mark beyond it.

### **PAROPSIS DIDYMA sp. nov.**

Plate xxxvii, figs. 17 and 18.

Prothorax and elytra flavous with black markings; head (except labrum and most of under parts), scutellum, sterna, abdomen (except tips of segments), and legs (except tarsi and parts of coxae and of tibiae), black; palpi and four or five basal joints of antennae flavous.

Head with sharply defined punctures of moderate size, becoming crowded about eyes; clypeal suture obsolete. Prothorax about thrice as wide as the median length; punctures sharply defined but not very dense, becoming larger on sides; without sublateral foveae. Elytra with irregular rows of rather large punctures, becoming coarse on sides; interstices with sharply defined and mostly small ones, but some as large as the seriate ones. Median ridge of prosternum dilated and punctate posteriorly, but not grooved. Length, 4-4.75 mm.

*Hab.* Queensland: Toowoomba (Mrs. F. H. Hobler). Type, I. 15532.

At first glance the black elytral markings look somewhat like those of *P. nigropicta* enlarged, but they are really on a different plan, and the prothoracic markings are very different. *P. quadrizonata* is a larger species, with much coarser punctures. The black prothoracic markings being basal, instead of median, distinguish from all varieties of *P. lachesis*; they are much as on *P. pulchella*; there are four basal spots: an isolated one in each hind angle, and

two conjoined in middle so as to have a somewhat M-shaped outline; on the elytra the black markings are all conjoined, and consist of a sutural vitta, a large medio-basal spot, narrowly connected along the base with the suture, and its apex touching an ante-median fascia (this appears to consist of four conjoined spots), beyond the middle there are six isolated flavous spots (or four, and the sides flavous), and the apical third is either entirely black or with two isolated flavous spots. From above the outlines of the prothorax and elytra appear to be continuous, but not from the sides.

**PAROPSIS IMMACULICOLLIS** sp. nov.

Plate xxxvii, figs. 19-21.

Flavous, elytral markings and most of femora black, scutellum and five to eight apical joints of antennae infuscated.

Head wide, with sharply defined punctures of two sizes about middle, rather coarse near eyes; clypeal suture ill-defined. Prothorax about thrice as wide as the median length, hind angles not rounded off; with rather dense and sharply defined but rather small punctures, becoming large on sides; without sublateral foveae. Elytra with irregular rows of large punctures, the interstices with small ones. Median ridge of prosternum feebly grooved towards base. Length, 3.75-4 mm.

*Hab.* New South Wales: Mittagong (H. J. Carter). Type, 1. 15534.

The pronotum is immaculate and the elytral markings are not close to those of any other species before me, although to a certain extent approaching those of *P. festiva*, they differ on the three specimens taken by Mr. Carter; on the type the suture is not very widely black, at about the basal third it is joined to a black spot, near the apex it is joined to a black mark that gradually dilates backwards, and is then suddenly deflected inwards to near the suture at the apical third, on each shoulder there is a curved mark like a reversed J, with its apex level with the subsutural spot at the basal third; on the second specimen the markings are enlarged so that the subapical curved mark touches the suture (as a result a large irregular pale spot is isolated on each side of the suture on the apical slope); on the third specimen the spot near the suture at the basal third and the curved mark on the apical third do not touch the suture. From above the outlines of the prothorax and elytra appear to be almost continuous, but from the sides there is to be seen a triangular notch at their junction, each side of elytra also at the basal third curves slightly downwards.

**PAROPSIS CALOMELOIDES** sp. nov.

Plate xxxvii, fig. 22.

Flavous, suture, a submedian spot and four isolated spots or vittae on apical slope black, four or five apical joints of antennae infuscated.

Head wide; with sharply defined punctures of moderate size or small, and dense only near eyes; clypeal suture well defined. Prothorax more than thrice as wide as the median length, with rather small and not very dense punctures in middle, becoming large on sides; without sublateral foveae. Elytra at base slightly wider than base of prothorax; with irregular rows of large punctures, the interstices with small ones. Median ridge of prosternum finely carinated on each side, but scarcely grooved in middle. Length, 5-5.5 mm.

*Hab.* Western Australia: Kellerberrin (J. Clark). Type, I. 15530.

An elongate elliptic species, with *Calomela*-like outlines, that looks out of place in Group 4; several species of Subgroup 4, of Group 5, have somewhat similar elytral markings; but the large punctures are so irregular about the middle, and towards the sides, that they could not fairly be regarded as forming but ten rows on each elytron. The sutural blackening commences just behind the scutellum, and terminates at or close to the apex; of the postmedian markings the outer one is a rather thin line about one-third the length of the elytra, and about one-fourth from the side, the vittae between it and the suture are obliquely placed behind its front end; the submedian spot or vitta is separated more than its own length from the vitta in line with it (the third one from suture).

#### GROUP 5. (SUB-GROUP 1.)

##### **PAROPSIS OCTOMACULATA Marsh.**

Plate xxxvii, figs. 22-30; xxxviii, figs. 31-33.

Blackburn rightly considered this species the most variable in the genus; it occurs abundantly in Queensland and extends to North-Western and Central Australia, and to New South Wales; on the typical form each elytron has two subbasal black spots, a zigzag oblique median fascia, and a curved subapical one. Of this form, eleven specimens before me have three prothoracic spots, and four have one. Blackburn said the prothorax had "always in my experience a black spot of varying size and shape on the middle of the base, and in some examples other spots." But in his collection (probably placed there after the remark was printed) there were several specimens with the prothorax immaculate. I have also seen specimens with the prothorax entirely black, and the elytra almost so; the under-surface and legs also vary considerably. Sketches of a few elytral markings are given, and many more could have been included.

##### **PAROPSIS SEMINIGRIPES sp. nov.**

Livid-flavous, tarsi, tips of tibiae, and antennae (except parts of three or four basal joints) deep black.

Head wide, with irregularly distributed punctures of small and moderate size, becoming rather crowded near eyes; clypeal suture rather deep. Prothorax about thrice as wide as the median length, sides evenly rounded, the hind angles completely rounded off; disc with rather sparse and small or very small punctures, a few large ones on sides; sublateral foveae not very large, but well defined. Elytra wide and strongly convex, base about one-fourth wider than base of prothorax; each with ten series of rather small punctures, but appearing rather large through "waterlogging," sides with rather coarse ones, interstices with minute but sharply defined ones. Median ridge of prosternum rather deeply grooved from near apex. Length, 7-8 mm.

*Hab.* Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15538.

Belongs to Subgroup 1 of Blackburn's Group 5 (formerly Group 6). Except for "waterlogging" of the seriate punctures on elytra and some faint infuscations on the pronotum (probably due to decomposition), the species is uniformly pale on the upper-surface, much as on *P. pachyta*, *P. incerta*, and *P. gracilipes*, from all of which it is distinguished by the deep black parts of legs; in addition, it is consistently smaller than *P. pachyta*, larger than *P. incerta*, and head with sparser and more irregular punctures, and wider than *P. gracilipes*, with the front angles of prothorax much less produced. Four specimens were obtained on the island.

#### GROUP 5. (SUB-GROUP 4.)

##### **PAROPSIS LEPIDA** Erichs.

Plate xxxviii, figs. 34 and 35.

On the typical form of *P. lepida* the suture and an interrupted stripe on each elytron are black, but on one specimen from Tasmania, and two from Victoria, the stripes are continuous, although not in a straight line.

##### **PAROPSIS JUCUNDA** Chp.

Plate xxxviii, fig. 36.

##### **PAROPSIS FESTIVA** Chp.

Plate xxxviii, fig. 37.

##### **PAROPSIS COMPLICATA** Blackb.

Plate xxxviii, fig. 38.

##### **PAROPSIS HEBE** Blackb.

Plate xxxviii, figs. 39 and 40.

Sketches of elytral patterns are given for comparison with those of other species.

**PAROPSIS NIGROLINEATA** sp. nov.

Plate xxxviii, figs. 41 and 42.

Flavous; head with a median spot, prothorax with five spots, scutellum, elytra with suture, sides (very narrowly) and four longitudinal stripes on each, and parts of antennae, of legs, and of under-surface black.

Head with irregular, sharply defined punctures, mostly of moderate size and denser on clypeus than elsewhere; a narrow deep impression near each eye; clypeal suture well defined. Prothorax scarcely thrice as wide as the median length, sides strongly rounded, hind angles not completely rounded off; with fairly dense and small to median punctures, becoming larger on sides but not coarse; with irregular remnants of sublateral foveae. Elytra at base about one-fifth wider than base of prothorax; each with ten rows of large punctures, usually outlining the black markings; interstices with small punctures. Apical three-fifths of median ridge of prosternum conspicuously grooved. Length, 6.5–8 mm.

*Hab.* Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 15539.

In general appearance somewhat like the striped form of *P. lignea* on a small scale, but elytra with punctures on the interstices much smaller than those in the rows. Mr. Carter and I obtained fairly numerous specimens on the mountain. The spot on the head is sometimes diamond-shaped, but is usually wider than long; the spots on the prothorax are submedian in position and vary in size, but are never very large, the outer spot on each side is slightly in advance of the median one, and distinctly in advance of the submedian ones; the median spot is sometimes narrowly connected with the scutellum and the interocular spot; of the discal stripes on the elytra the first and fourth are continuous from the base (or near it) to near the apex, the second is usually joined to the first at the base and sometimes at the apex, but is usually twice interrupted; the third is joined to the fourth on the shoulder, and is usually interrupted beyond the middle; the under parts that are black or blackish are the sides of the metasternum, and sometimes the middle of each abdominal segment, the coxae, base and apex of femora, and of tibiae, and the tarsi. The punctures on the sides of the prothorax are larger than the others, but they are not suddenly much larger as on most species of the genus.

**PAROPSIS FLAVOINCLUSA** sp. nov.

Plate xxxviii, fig. 43.

Pale reddish-castaneous, most of head black, prothorax with variable markings, scutellum black, elytra flavous, the suture and a discal vitta on each (rather nearer side than suture) black, two or three apical joints of antennae infuscated



Head short and wide; with sharply defined punctures of moderate size, with some small ones scattered about; clypeal suture inconspicuous. Prothorax more than thrice as wide as long, hind angles well defined; punctures small in middle, becoming larger on sides; without sublateral foveae. Elytra with outlines sub-continuous with those of prothorax, and at base very little wider; with ten rows of fairly large punctures on each elytron, the interstices with sparse and minute ones. Median ridge of prosternum not at all grooved. Length, 3.25-4 mm.

*Hab.* Western Australia: Ankertell (H. W. Brown). Type, I. 15547.

The black markings of elytra are conjoined so as to enclose two pale longitudinal vittae, and are alike on the two specimens before me; but the prothoracic markings are evidently variable; on the larger specimen an irregular curved line touches a black basal mark at its ends and middle, and almost touches the middle of the apex, but on the smaller specimen only part of the base is black; on the larger specimen the median base of the mesosternum, and the middle of each abdominal segment, is black, on the smaller one the intercoxal process of the abdomen is the only dark part of the under-surface.

### **PAROPSIS PROSTERNALIS sp. nov.**

Plate xxxviii, fig. 44.

Flavous; extreme base of head and two small interocular spots, base of scutellum, suture and several lines on elytra, and median front of prosternum black; three or four apical joints of antennae infuscated.

Head rather short and wide; with rather dense, sharply defined punctures; clypeal suture well defined. Prothorax about thrice as wide as the median length, hind angles not rounded off; with rather small and not very dense but sharply defined punctures, on the sides mixed with rather large ones; without sublateral foveae. Elytra at base very little wider than base of prothorax; each elytron with ten rows of rather large deep punctures, the sides also with large ones; interstices with small and rather sparse ones. Median ridge of prosternum feebly grooved on basal two-thirds. Length, 4.5-5 mm.

*Hab.* South Australia (Rev. A. P. Burgess). Type, I. 15548.

Three narrow black lines, on each elytron, commence almost level near the base; the first is between the second and third rows of punctures and terminates at about one-third from the base, the second is between the fourth and fifth rows of punctures and extends to near the apex, where it joins one that starts from the shoulder; in addition, there is the remnant of another, which joins in with the humeral one near the apex. The long lines are somewhat as on some specimens of *P. interrupta*, but are narrower, and the sutural markings are very different; the general form is also slightly more elongate.

**PAROPSIS ERYTHROCEPHALA** sp. nov.

Black; head, a median line on prothorax, a median spot on scutellum, under-surface, legs, antennae (two or three apical joints infuscated), and palpi more or less red.

Head wide; with small punctures interspersed with others of medium size, the latter becoming dense near eyes; clypeal suture rather feebly defined. Prothorax almost four times as wide as the median length, hind angles almost rectangular; with small and minute punctures, becoming large and rather dense on sides. Elytra at base very little wider than base of prothorax; each elytron with ten distinct rows of not very large punctures, the sides with larger and irregular ones, interstices with minute ones. Median ridge of prosternum shallowly grooved on apical half. Length, 3.75–4 mm.

*Hab.* Western Australia: Cue (H. W. Brown). Type, I. 15543.

A small, black and red species, the pronotum with the appearance as of being cleft in the middle. One of the specimens has some of the marginal parts of the prothorax obscurely diluted with red, probably indicating variability, but except for this the three specimens before me closely resemble each other. From above the outlines of the prothorax and elytra appear to be continuous, but not from the sides; on two specimens a faint depression on each side of the pronotum indicates the positions of sublateral foveae, but from the third even these are absent. The elytra are scarcely shagreened, but they are not as polished as the prothorax. I know of no closely allied species.

**PAROPSIS MEDIORUFA** sp. nov.

Plate xxxviii, fig. 45.

Black; some obscure markings on head and prothorax, sides of the latter and of the elytra (very narrowly), an irregular zigzag submedian fascia on the elytra and a spot on scutellum, under-surface (parts of prosternum excepted) and legs more or less reddish, or reddish-flavous, antennae paler, but some apical joints slightly infuscated.

Head wide; with small and medium-sized punctures intermingled; clypeal suture fairly distinct from some directions. Prothorax more than thrice as wide as the median length, hind angles slightly rounded off; punctures minute and small, becoming large and rather dense on sides. Elytra at base scarcely wider than base of prothorax; each elytron with ten distinct rows of rather small but sharply defined punctures, the sides with larger irregular ones, becoming still larger and crowded about apex, interstices with minute ones. Median ridge of prosternum rather narrowly grooved on basal half. Length, 4.75 mm.

*Hab.* Western Australia: Cue (H. W. Brown). Type, I. 15546.

An elliptic, feebly convex species, with the seriate punctures on elytra larger on sides and posteriorly than towards the base and suture, the apical punctures being unusually crowded and large; the pale elytral blotch, or fascia, occupies about one-third of the surface in length, and towards each side just passes the tenth row of punctures. The outlines of the prothorax and elytra are practically continuous, except for a slight notch on each side at their junction.

**PAROPSIS MACROSTICTA** sp. nov.

Plate xxxviii, figs. 46 and 47.

Black; labrum, prothorax (some irregular infuscations excepted), scutellum, a large discal spot on each elytron, and an obscure subapical spot, junction of abdomen and metasternum at sides, tarsi, antennae (several of the apical joints infuscated), and palpi, more or less reddish.

Head wide; with small and medium-sized punctures in middle, becoming larger and dense about eyes; clypeal suture fairly distinct from some directions, inconspicuous from others. Prothorax more than thrice as wide as the median length, hind angles almost rectangular; with small but sharply defined punctures in middle, becoming large and somewhat crowded on sides; without sublateral foveae. Elytra at base very little wider than base of prothorax; each elytron with ten rows of rather large punctures, becoming larger posteriorly, sides with dense and rather coarse punctures, the interstices with small and minute ones. Median ridge of prosternum feebly grooved along middle of basal half. Length, 4.75–5 mm.

*Hab.* South Australia (Rev. A. P. Burgess). Type, I. 15545.

A moderately elongate not very strongly convex species, with rather large seriate punctures on elytra. There are some irregular infuscations on the prothorax, but they are not very sharply outlined and are not alike on the two specimens taken by Mr. Burgess; on one of them the large elytral spots are conjoined at the suture, but on the other they are isolated.

**PAROPSIS CALOPTERA** sp. nov.

Plate xxxviii, figs. 48–50.

Flavous; head black except in front and near eyes, prothorax with a black strip at base (not extending to sides) joined to a median patch that touches the middle of apex, scutellum, and some conspicuous elytral markings black, four or five apical joints of antennae infuscated.

Head wide; with rather large and small punctures intermingled; clypeal suture inconspicuous. Prothorax about four times as wide as the median length, hind angles almost rectangular; middle with small but sharply defined punctures,

becoming larger and crowded on sides; without sublateral foveae. Elytra at base very little wider than base of elytra; each elytron with ten regular rows of fairly large punctures, and an irregular one on sides; interstices with sharply defined and rather small punctures. Median ridge of prosternum with a row of punctures on each side of basal half, but scarcely grooved in middle. Length, 3.75–4.25 mm.

*Hab.* Western Australia: Cue (H. W. Brown). Type, I. 15540.

An elongate-elliptic species with *Calomela*-like markings. *P. lachesis* is wider and more convex, with markings on a different plan; *P. quadrizonata* and *P. nigropicta* are wider and with isolated prothoracic spots, and (as *P. lachesis* also) belong to a different section of the genus. On the elytra, including the apex, there are four black fasciae, decreasing in size posteriorly; of these, one at the basal third is widely connected with the base along the suture, and with each shoulder; the second fascia is postmedian, narrowly connected with the first only along the suture, and with the third along the suture and towards the sides; the third is about one-fifth from the apex, with which it is connected along the middle and also towards each side, so that three more or less round, and large pale spots, are isolated on each elytron; on several specimens there is a narrow black edging behind the middle coxae, this being the only dark part of the under-surface. There are some rusty-looking patches on the flavous parts of some specimens, probably indicating that the colour was considerably redder on living ones.

Variety. Three specimens that were mounted with eight of the typical form by Mr. Brown (probably indicating that he obtained them in their company, or considered them as belonging to the same species) have the pale parts more reddish and differ considerably in the elytral markings (the black parts of the head and prothorax are much the same); they each have an isolated black fascia on the elytra at the basal third (on two specimens crossing the suture, on the other interrupted near it), and a very irregular fascia at the apical third (on two specimens widely connected along the suture with an apical strip; but on the other appearing as a wide free spot on each elytron); on two of them the sterna and abdomen are almost entirely black, and parts of the femora; on the other the under-surface and legs, except a narrow margin behind the middle coxae, are entirely pale.

### **PAROPSIS ZICZAC sp. nov.**

Plate xxxviii, fig. 51.

Reddish-flavous, upper-surface with conspicuous black markings; three or four apical joints of antennae slightly infuscated.

Head wide, with minute punctures and others of medium size, the latter numerous only near eyes; clypeal suture very feeble. Prothorax almost four times as wide as the median length, hind angles almost rectangular; near base and apex with small but fairly sharp punctures, minute across middle, becoming rather large and numerous on sides; without sublateral foveae. Elytra wider than prothorax, by the width of scutellum on each side at base; each elytron with ten distinct rows of not very large but sharply defined punctures, smaller near suture than elsewhere, sides with rather dense and somewhat larger punctures, the interstices with minute ones. Median ridge of prosternum with a narrowly impressed line on each side of basal half. Length, 4.4-5 mm.

*Hab.* Western Australia: Cue (H. W. Brown). Type, I. 15541.

The base of the prothorax is narrowly marked with black, on several specimens it has slight extensions to about one-fifth from the base, but on one the marking is scarcely traceable; the scutellum is pale in the middle; the elytra are narrowly black at the base, rather widely on the suture, and have three sharply defined zigzag fasciae: one at the basal fourth, connected with the base near each shoulder as well as along the suture; one at the middle connected with the third towards the sides, as well as along the suture, and the third at the apical fourth; it is usually connected with a subtriangular mark on the suture, but on one specimen appears as a large free spot on each elytron. On one specimen two small black spots are visible at the base of the head (this being somewhat extruded), but on five others no spots are visible. The median markings of the elytra are somewhat as on *P. nigropicta*, of Group 5, but the other markings are different. From *P. caloptera* it differs in being wider, elytral markings more complicated, and prothorax black only about base.

#### GROUP 5. (SUB-GROUP 6.)

##### **PAROPSIS HAMADRYAS** Stal.

Plate xxxviii, figs. 52-55.

Very variable in its markings, both of elytra and prothorax.

##### **PAROPSIS PLATYNOTA** sp. nov.

Plate xxxviii, fig. 56.

Dark reddish-brown or piecous-brown, some specimens with parts almost black; sides of prothorax, sides and discal markings of elytra, legs, antennae, and palpi, more or less flavous, or reddish-flavous.

Head rather wide, sides oblique to labrum and then truncated; with dense and fairly large, sharply defined punctures; clypeus with somewhat denser punctures than on the adjacent surface, its suture moderately or feebly defined.

**Prothorax** about four times as wide as the median length, its hind angles not rounded off; punctures minute in middle, rather large and numerous on sides; without sublateral foveae. Elytra with outlines (except for a feeble notch on each side of base) continuous with those of prothorax, each elytron with ten conspicuous (but in places semidouble) rows of punctures of moderate size, the sides and especially the apex, with larger and more or less crowded punctures, interstices with very minute ones. Median ridge of prosternum wide and ill-defined in front, basal half not grooved. Length, 4.4-5 mm.

*Hab.* Western Australia: Toodyay (W. Klem), King George's Sound (Dr. E. W. Ferguson). Type, I. 15549.

Rather widely elliptic and flatter than any other species before me, the median third of the prothorax and elytra as seen from in front or behind appears perfectly flat; *P. hamadryas*, when so viewed, appears gently convex there; *P. vesta* is perhaps its nearest ally, but that species is smaller, and decidedly less depressed, although less convex than usual, its prothorax is paler, and usually has markings. As noted by Blackburn, for the subgroup, the head in front of the eyes appears to have three margining straight lines. The marginal gutter of the elytra is wider and more pronounced than in most species of the genus. The middle of the pronotum is darker than the sides, but somewhat paler than the adjacent parts; the discal markings of the elytra vary in definition, on one specimen they are very obscure, from another they are entirely absent, but they are usually well defined and consist of three series of longitudinal vittae usually more or less conjoined: the first series is subbasal and on each elytron consists of three vittae within the sutural half, of which two are usually conjoined to form an irregular reversed J; the second series forms a submedian fascia, interrupted at suture, and more distant from sides; the third series forms a still more irregular fascia at and about the summit of the apical slope, with one vitta on each elytron (that between the second and third rows of punctures—disregarding the short scutellar row) much longer than the others, but sometimes two or three other vittae almost as long.

### **PAROPSIS PLATYCEPHALA** sp. nov.

Plate xxxviii, fig. 57.

**Flavous**; most of upper-surface of head, scutellum, suture (narrowly), and ten spots on elytra, and most of sterna and of abdomen, black or blackish; tip of antennae slightly infuscated.

Head decidedly longer than usual, median part flat, sides oblique in front of eyes; front of clypeus gently incurved, its suture distinct at sides, very feeble elsewhere; with small and medium-sized punctures, somewhat larger at sides of and behind eyes than elsewhere. Prothorax almost four times as wide as the

median length, hind angles not rounded off; with small or minute, but sharply defined punctures in middle, becoming rather large and numerous on sides, without sublateral foveae. Elytra moderately convex, outlines, except for a slight notch on each side of base, continuous with those of prothorax; each elytron with ten well-defined rows of moderately large punctures, smaller near suture than elsewhere, the sides with somewhat larger and numerous punctures; interstices with minute ones. Middle of prosternum narrowly ridged along basal two-thirds. Length, 3.5 mm.

*Hab.* Western Australia: Vasse River (A. M. Lea). Type, I. 15550.

The head has a curious appearance as of having been pulled out and much of the normally concealed base exposed, with the eyes in advance of the middle; but this is probably not the case, as the punctures at its base are quite as strong behind the eyes as at the sides of them, whereas on specimens of other species in which the normally concealed base is exposed, the punctures there are always much sparser and smaller. In front of the eyes the head is as in Subgroup 6; from *P. lucina*, of that subgroup, it differs in being wider and less convex, elytra with four median instead of postmedian spots, and the two subbasal spots nearer the suture; *P. hamadryas* (a very variable species) is wider, with coarser cephalic punctures. The spots are not very large and are more or less angular, the first one on each elytron is near the base, half-way between the shoulder and scutellum, then there are two transversely placed ones just before the middle, of which the outer one is the longer, then one touching the suture about the summit of the apical slope (so that, with its fellow, a short fascia is formed), and the fifth is placed obliquely half-way between the fourth and the margin. Some of the elytral punctures are infuscated, increasing their apparent size.

### **PAROPSIS MACULIVENTRIS** sp. nov.

Plate xxxviii, figs. 58-60.

Flavous; base of head, scutellum, some elytral markings, part of sterna, and two transverse spots on each of the three median-segments of abdomen, black; apical half, or less, of antennae infuscated.

Head gently convex between eyes, sides in front of them oblique; front of clypeus truncated, its suture distinct only at sides; punctures of moderate size and sharply defined, larger and denser near eyes than elsewhere. Prothorax almost four times as wide as the median length, hind angles gently rounded off; punctures small in middle, becoming rather large and dense on sides; without sublateral foveae. Elytra moderately convex, base slightly wider than base of prothorax; each elytron with ten distinct rows of punctures, the sides and especially the apex with crowded and larger punctures; the interstices with

minute ones. Median ridge of prosternum narrowly impressed on each side of basal half, and not grooved in middle. Length, 2.5–3.5 mm.

*Hab.* South Australia: Murray Bridge (H. H. D. Griffith and A. M. Lea).  
Type, I. 15551.

The pale parts of the head are of a brighter colour than the rest of the upper-surface, the black basal part varies in extent, but its front edge is more or less sinuous; on one specimen there are two small interocular spots; the elytral markings vary considerably, but there appears to be always a spot on the base near the shoulder (the spot sometimes small and free, but on some specimens larger and touching the base), and there are two sinuous fasciae (or remnants of them) at and below the summit of the apical slope, the two fasciae sometimes connected at the suture and towards the sides, so as to enclose two transverse spots, the suture also is usually black at the base, with an attached spot on each side of it at the basal fourth; on one specimen there are only two distinct spots on each elytron: one near the base, the other at the summit of the apical slope; the six abdominal spots are present on all the specimens. The postmedian markings of the elytra are somewhat as on some forms of *P. hamadryas*, although they appear never to be connected with the subbasal ones as they frequently are on that species, the prothorax appears to be always immaculate (at least it is so in the eight specimens before me), and the size is consistently much smaller; some specimens of *P. dryope* are almost as small, but they have different elytral markings, prothorax usually quadrimaculate, etc.; and *P. vesta* is a flatter species, with very different elytral markings.

### Explanation of Plate xxxvii.

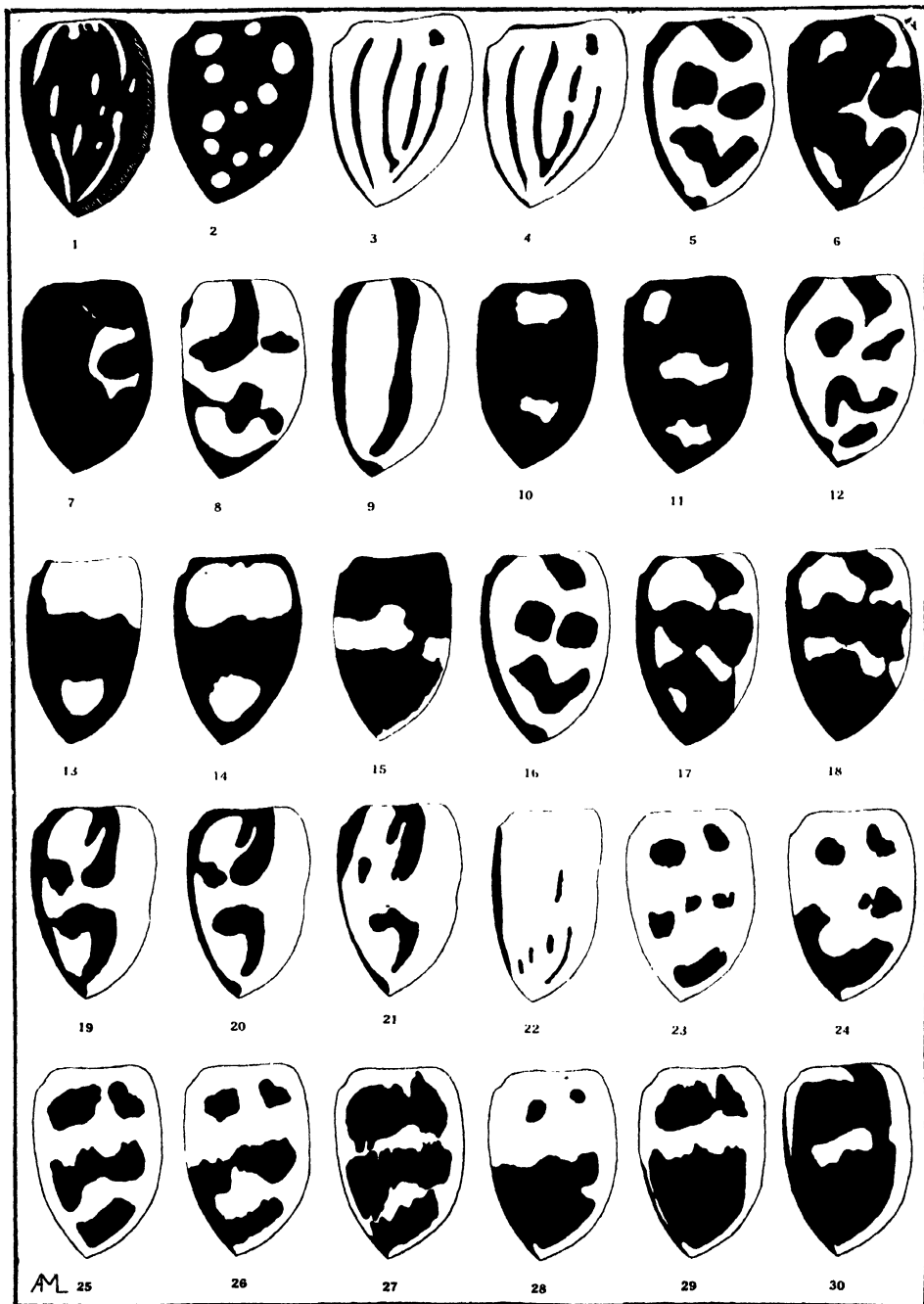
Elytra of species of *Paropsis*: 1. *anomala* Blackb.; 2. *s-notata* Lea; 3. 4. *novemlineata* Lea; 5–7. *lachesis* Stal.; 8. *nigropicta* Chp.; 9. *pulchella* Chp.; 10. *tetraspilota* Chp.; 11. *rufopicta* Blackb.; 12. *quadrizonata* Blackb.; 13. *haematosticta* Lea; 14. *isolata* Lea; 15. *medioflava* Lea; 16. *cardinalis* Lea; 17. 18. *didyma* Lea; 19–21. *immaculicollis* Lea; 22. *calomeloides* Lea; 23–30. *octomaculata* Marsh.

### Explanation of Plate xxxviii.

Elytra of species of *Paropsis*: 31–33. *octomaculata* Marsh; 34. 35. *lepida* Er.; 36. *jucunda* Chp.; 37. *festiva* Chp.; 38. *complicata* Blackb.; 39. 40. *hebe* Blackb.; 41. 42. *nigrolineata* Lea; 43. *flavoinclusa* Lea; 44. *prosternalis* Lea; 45. *mediorufa* Lea; 46. 47. *macrosticta* Lea; 48–50. *caloptera* Lea; 51. *ziczac* Lea; 52–55. *hamadryas* Stal.; 56. *platynota* Lea; 57. *platycephala* Lea; 58–60. *maculiventris* Lea.

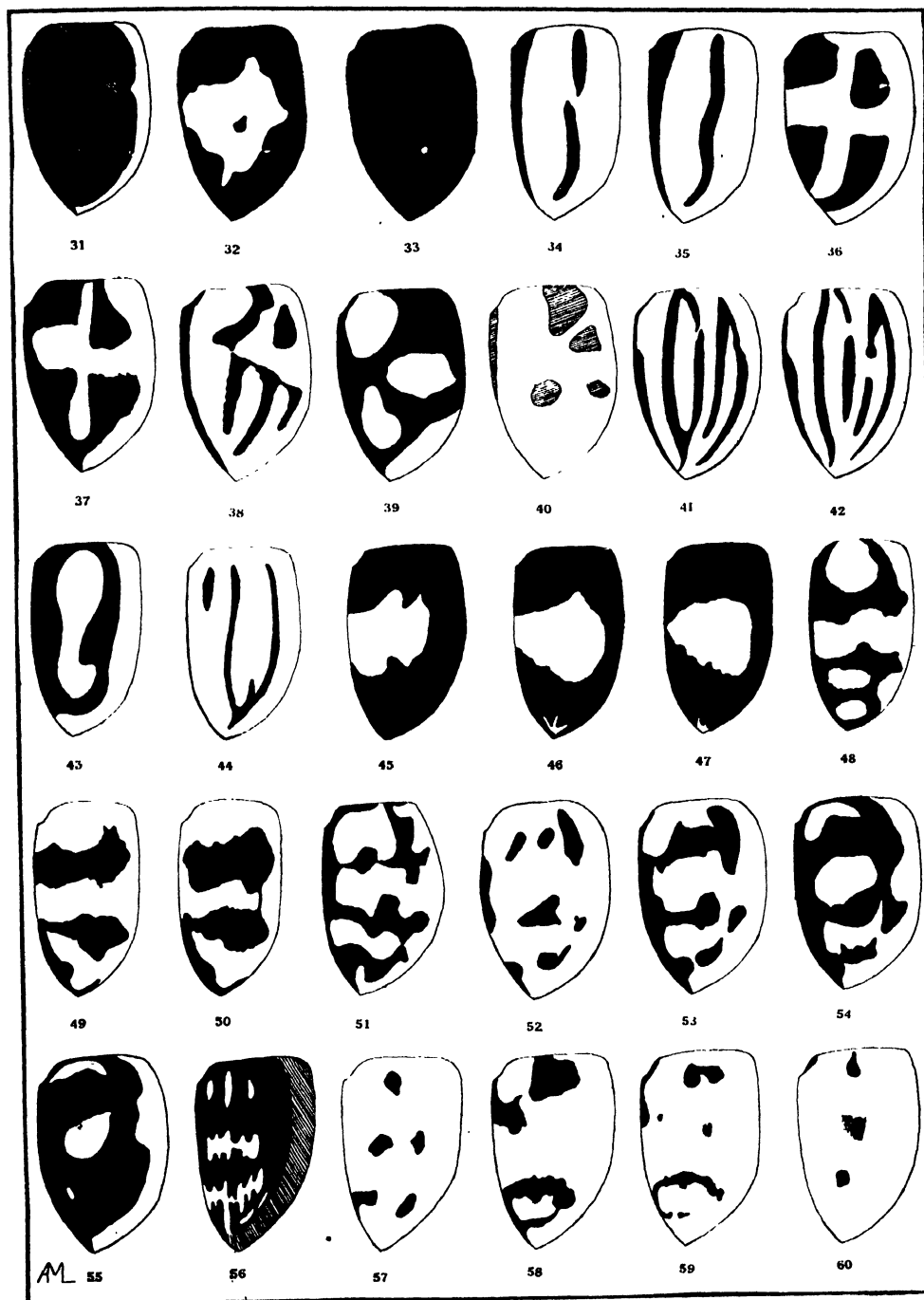






*ELYTRAL PATTERNS OF BEETLES.*





ELYTRAL PATTERNS OF BEETLES.



# REVIEW OF AUSTRALIAN MANTIDAE.

## PART II.

By NORMAN B. TINDALE, SOUTH AUSTRALIAN MUSEUM

Plate xxxix and text fig. 387.

THE additions recorded herein include two new genera and three species. With additions and corrections to Part I, the number of recorded Australian species is eighty-one. When a revision of the Malayan Hierodulae is made, the Australian species at present referred to *Parkierodula* will probably be removed to *Hierodula* and allied genera. Mr. B. Uvarov informs me that the type of *Trachymantis obesa* Giglio-Tos in the British Museum, was taken in Australia, and bears a label "Hermannsburg, Central Australia."

### SUB-FAMILY IRIDOPTERYGINAE.

#### **BOLBE PYGMEA** Saussure.

Plate xxxix, fig. 5.

The figure is of a male specimen from Port Darwin, Northern Territory.

#### **NEOMANTIS AUSTRALIS** Saussure & Zehntner.

Plate xxxix, fig. 3.

*Tropidomantis australis* Sauss. & Zehn., Grandidier, Hist. Madagascar, Orth., i, 1895, p. 169, ♂; *Neomantis australis* Giglio-Tos, Bull. Soc. Ent. Ital., 1914, p. 48; Hebard, Proc. Acad. Nat. Sci. Philad., 72, 1920, p. 21, ♂.

The description of this species is in a rather inaccessible publication; an extract is given here.

♂ "Prasina, gracilis. Caput sensim illo *T. tenerae* similis, lobo externo verticis tamen extus acutiore, interno obsoleto. Ocelli in trigonum aequilateralem exserti. Scutellum faciale margine supero haud truncato. Pronotum rhomboidale, anterius et posterius fere aequaliter attenuatum; apice anterius anguste parabolico. Elytra hyalina; ubique irregulariter late reticulata; venis virescentibus apice obtuso; margine costali toto subarcuato; campi marginalis venulis perpendicularibus, ad costam puncto nigro ornatis; vena media indivisa. Alae obtusiusculae. Tibiae anticae spinis 10:9 regularibus, externis rectis, armatae. Femora intus spinis 12 alternis minoribus ac majoribus instructa. Abdomen gracile. Lamina supraanalis acute-lanceolata, basi latiuscula, rotundata, apice angustissima; laminam infragenitalem vix superante. Cerci longi, teretes, articulis longiusculis. Long., 22; proth., 4.5; elyt., 16; latit., elyt., 5.5 mm."

♀ Green, similar to male, but with elytra opaque, greenish, a fore-marginal band greenish-ochreous; at each vein on fore-margin there is a distinct black spot; at one-half there is the appearance of a conspicuous transverse bar, caused by an area of dense reticulation bordered externally by an area of sparse reticulation. Length of body, 22 mm.; of pronotum, 5 mm.; of elytra, 15 mm.

*Hab.* Queensland (type): South Johnstone River (H. W. Brown, type female, I. 14588), Cairns district.

### **NEOMANTIS HYALINA sp. nov.**

Plate xxxix, fig. 1-2.

♂ Green. Allied to *N. australis*, but differs in having the antero-lateral margins of the pronotum more evenly rounded, the elytra hyaline (almost transparent), without traces of a fore-marginal yellowish band or black spots along the fore-margin; the reticulation of veins is pale green, and there is a semi-opaque transverse band of dense reticulation at one-half, followed exteriorly by a zone of sparse reticulation. Length of body, 20 mm.; of pronotum, 4 mm.; of elytra, 14.5 mm.

♀ Green, similar to male, but larger. Length of body, 21 mm.; of pronotum, 5 mm.; of elytra, 16.5 mm.

*Hab.* Northern Territory: Groote Eylandt (January, 1922, N. B. Tindale), Melville Island (W. D. Dodd); Queensland: Cairns district (F. P. Dodd). Types, I. 14592.

This species appears superficially very distinct from *N. australis* by the absence of the yellow fore-marginal band and black spots of the elytra, which are hyaline and not opaque. There are six specimens, four females and two males, in our collection, and these exhibit little variation. A spirit-bleached female from New Guinea probably indicates a third species, but the specimen is not in condition fit for description. On Groote Eylandt *N. hyalina* came to light in company with *Bolbe maia*. The figures given are of cotype females from Groote Eylandt and the Cairns district.

Mantidae are subject to dimorphism in many species, and further field observation may show that the present species is a phase of *N. australis*.

### **KONGOBATHA DIADEMATA Hebard.**

Plate xxxix, fig. 4.

*Kongobatha diademata* Hebard, Proc. Acad. Nat. Sci. Philad., 72, 1920, p. 23, pl. i, fig. 1-2.

There are three females of this species in our collection from Cairns, one of which is figured. The colour is pale green, and the elytra and wings are pale transparent green, with a silvery lustre.

**IMA gen. nov.**

Allied to *Tropidomantis*. Size small. Male with head wide, compressed; eyes large, prominent, rounded; vertex slightly elevated, with a rounded projection above eyes; clypeus quadrilateral, anterior margin waved, posterior margin convex, with two narrow ante-median and a wide curved post-median transverse ridge, forming a sub-median depression; facial shield transverse, six-sided, elevated, and projecting along upper margin, a rounded swelling in the lower lateral corners; ocelli elevated, large, a broad longitudinal depression between ocelli and eyes; antennae slender, the basal joint large, the second small, round, the third long, cylindrical, fourth short, the following joints becoming longer and more slender. Pronotum two and one-half times as long as wide, shaped nearly as in *Neomantis*; the median carina nearly obsolete, and the latero-median depressions less pronounced; all the margins with minute tubercles forming a border. Elytra long, narrow, reaching beyond tip of abdomen, fore-margin nearly straight, apex well rounded, the hind-margin gently rounded. Abdomen slender, parallel-sided; cerci short, cylindrical, hairy. Anterior legs with coxae moderate, unarmed; femora rather long, widest at about one-third, armed with three discoidal spines, the first and second large, the third smaller, inner margin with ten spines and an apical one, arranged according to size, as follows: S S s S s S S s s S S, outer margin with four spines and a large apical one; tibiae armed with eight graduated inner and six outer marginal spines, the outer marginal ones arranged in series as s S s s S S, with a distinct gap between the first, nearly obsolete, spine and the second larger one, the fifth not as large as the sixth; the first joint of tarsi longer than the four following together. Median legs slender (posterior legs broken off in the type specimen).

Genotype, *Ima fusca* sp. nov.

This genus presents unusual features in the armature of the anterior tibiae, and the median carina of the pronotum is inconspicuously developed, but the rounded projections above the eyes, the shape of the pronotum, and the spines on the anterior femora indicate its relationship with *Tropidomantis* of the Iridopteryginae.

**IMA FUSCA sp. nov.**

Text figure 387.

♂ Slender. Light-brown with darker markings. Head dull opaque brown, pronotum brown, with darker longitudinal markings and with scattered dark-coloured tubercles. Elytra hyaline, veins brown, several longitudinal diffused brown markings on the anterior portion; wings hyaline. Abdomen brown. Anterior legs light-brown, with scattered dark tubercles; coxae and femora with



upper margins darker. Median legs light-brown, with scattered tubercles darker. (Posterior legs broken off.) Length of body, 29 mm.; of pronotum, 5 mm.; of elytra, 14.5 mm.; of anterior femora, 5 mm.; width of head, 3 mm.

*Hab.* Queensland: Cairns district (A. M. Lea). Type, I. 14591; unique.

The text figures show a diagrammatic representation of the head ( $\times 20$ ) viewed from the front, and details of the right anterior leg ( $\times 8$ ).

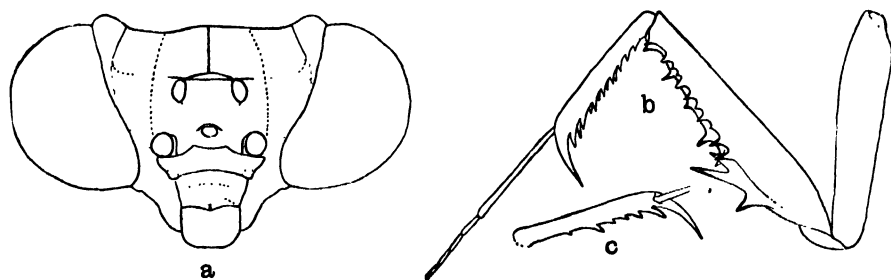


Fig. 387. *Ima fusca* sp. nov. a. Head of type male. b. Right anterior leg (latero-internal aspect). c. Right anterior tibia (latero-external aspect).

#### SUB-FAMILY MANTINAE.

#### **TENODERA BLANCHARDI** Giglio-Tos.

*Tenodera blanchardi* Giglio-Tos, Bull. Soc. Ent. Ital., 43, 1911, p. 46; Hebard, Proc. Acad. Nat. Sci. Philad., 72, 1920, p. 51; *Mantis fasciata* Burm., Handb. Ent., ii, 1838, p. 534 (*partim*); *Mantis costalis* Blanch., Voy. au Pôle Sud, iv, 1853, p. 353 (*partim*); *Mantis fusca* var. Blanch., *l.c.*, Orth., pl. ii, fig. 2. *Hab.* Queensland: Cape York (Giglio-Tos); Northern Territory: Darwin (Giglio-Tos); New Guinea; Bismarck Archipelago; Moluccas; Celebes.

Specimens of this species have not been examined. According to Blanchard's figure the wings are entirely hyaline, and the species much larger than the one recently figured (*antea*, pl. xxi, fig. 54) as *T. intermedia*. The type of *T. intermedia*, from New Zealand, is described as having a dark mark at the base of the wings; in the Australian specimens this mark is absent.

It is probable that all Australian specimens of *Tenodera* other than those of *T. australasiae* should be referred to a single species.

#### **ZOPHEROMANTIS** gen. nov.

Allied to *Hierodula*. Female with head moderately wide, vertex broad, arched, eyes prominent; clypeus somewhat wider than long, obtuse angled, distinctly divided by a median longitudinal ridge, expanded at junction with the straight upper margin; facial shield transverse. Pronotum elongate, the lateral margins distinctly curved from anterior margin to the transverse sulcus, then

forming the supra-coxal expansion, narrowing posteriorly, but with the posterior half gradually dilated; margins minutely serrated, the surface with scattered minute tubercles; median carina moderately prominent; a latero-median impression posterior to the transverse sulcus. Elytra not reaching apex of abdomen, anterior margin gently rounded, posterior margin well rounded; anterior portion opaque, remainder translucent; without traces of a stigma. Wings hyaline. Abdomen somewhat ovate, flattened; cerci short, with segments short and conical. Anterior legs with coxae stout, as long as metazone of pronotum, weakly armed with fine spines on both margins; femora stout, armed with four discoidal spines, the first three large, the fourth smaller and projecting forward, an outer marginal row of four graduated spines and one apical one, and an inner marginal series of seventeen spines placed in series as follows: s S s S s S s s s S s s S s s s S; tibiae armed with an outer marginal row of ten and an inner marginal row of twelve graduated spines; the first joint of tarsi longer than the rest together. Median and posterior legs short, stout; apical spines of femora present.

Genotype, *Zopheromantis trimaculata* sp. nov.

### **ZOPHEROMANTIS TRIMACULATA** sp. nov.

Plate xxxix, fig. 6.

♀ Green. Head smooth, dull green; antennae short, filamentous, green, with scattered setae. Pronotum dull green, margins and median carina brownish (in dried specimen); prosternum pale green, with a reddish tinge. Elytra with costa dark green, rest of elytra green, becoming paler posteriorly; under-surface of elytra with costa dark red. Wings hyaline, the costal margin opaque, green. Abdomen smooth, yellow, margins and posterior portion green, under-surface greenish. Anterior legs with coxae green on outer face; inner face pale greenish with three equidistant, well-defined, brown spots or small blotches near the anterior margin; femora outwardly green, inwardly reddish at base, paler towards apex, the spines tipped with brown; tibiae and tarsi yellowish-green. Median and posterior legs pale green. Length, 41 mm.; of pronotum, 13 mm.; of elytra, 20 mm.; of wings, 15 mm.

*Hab.* South Australia: Teetulpa, in January (G. Farrand). Type, I. 14590; unique.

This species is not close to any other, and is at once distinguishable by the abbreviated elytra and wings, stout yellowish abdomen, and the three brownish spots on the inner face of the anterior coxae.

### **HETERARCHIMANTIS** Werner, 1922 (*lobata*).

*Heterarchimantis* Werner, Zool. Med. Rijks Mus. Leid., vii, 1922, p. 121.

This genus is defined by Werner as follows: "Differt a genere *Archimantis*

lobis ante apicem femorum intermediarum et posteriorum sitis. Genus australianum," and is placed in a special subfamily, Heterarchimantinae.

### **HETERARCHIMANTIS LOBATA Werner.**

*Heterarchimantis lobata* Werner, l.c., p. 121.

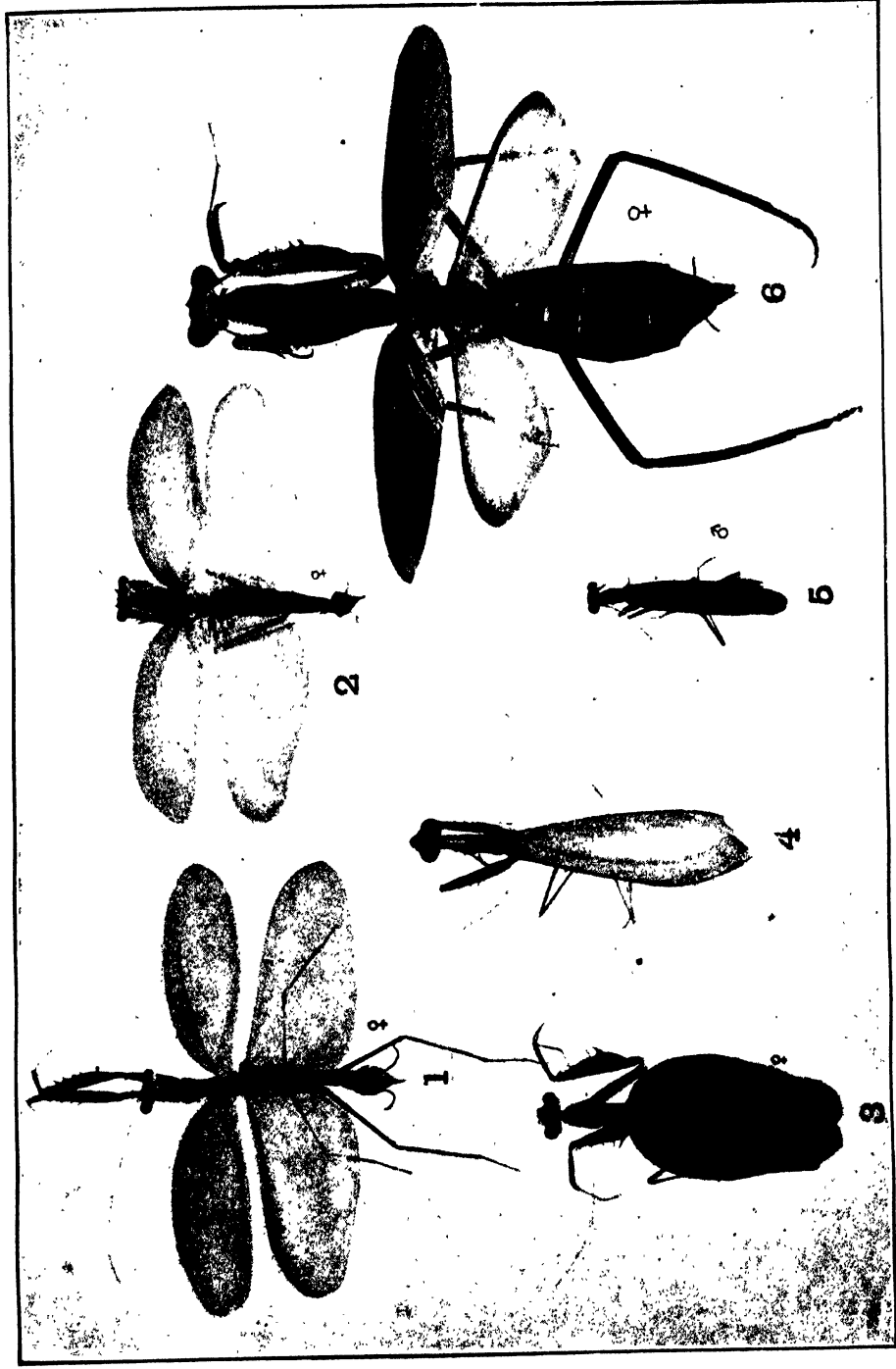
*Hab.* Northern Territory: Darwin.

The chief distinction between this species and *Archimantis latistyla* is said to be the presence of lobes on the apical portions of the median and posterior femora.

A larva in our collection, which is very close to larvae of *Archimantis quinquelobata*, differs in having a conspicuous lobe near the apex of the median and posterior tibiae, and may represent another species; it was taken at Palm Creek, Central Australia. In the absence of further material it is difficult to say whether the above are individual variations or valid species.

### **Explanation of Plate xxxix.**

- Fig. 1. *Neomantis hyalina* Tindale, Groote Eylandt, cotype female.
- Fig. 2. *Neomantis hyalina* Tindale, Kuranda, cotype female.
- Fig. 3. *Neomantis australis* Saussure, South Johnstone River, type female.
- Fig. 4. *Kongobatha diademata* Hebard, Cairns district, female.
- Fig. 5. *Bolbe pygmaea* Saussure, Darwin, male.
- Fig. 6. *Zopheromantis trimaculata* Tindale, Teetulpa, type female.



AUSTRALIAN PRAYING INSECTS.



## NOTES ON AND THE SYNONYMY OF *XANTHOBERIS* *SILIACAE* WHITE (DIPTERA-STRATIOMYIIDAE).

By G. H. HARDY, WALTER AND ELIZA HALL FELLOW IN ECONOMIC BIOLOGY,  
QUEENSLAND UNIVERSITY.

Text fig. 388.

OWING to the kind courtesy of the Director of the South Australian Museum, I have been able to examine and prepare drawings of the holotype of *Xanthoberis siliacea*, the generic and specific names of which were proposed by White. That the generic characters were quite inadequately described (if not misleadingly so) is only too apparent from White's remarks, and therefore it is not surprising to find that the genus has remained unrecognized and also that the species has been redescribed under other generic and specific names. The genus was correctly placed by White as being allied to *Neoxaireta*, although judging from his description alone it would be difficult to credit this.

### **XANTHOBERIS White.**

*Xanthoberis* White, Proc. Linn. Soc. N.S. Wales, xli, 1916, p. 75, fig. 2; Hardy, Proc. Roy. Soc. Tasm., 1920, p. 41.

*Apospasma* Enderlein, Mitt. Zool. Mus. Berl., x, 1921, p. 197, fig. 11.

Enderlein's figure of the antennae of his specimen is practically identical with that prepared by me from White's genotype (a and b). As the characters of the antennae in respect to the proportions of the joints are identical, there can be no doubt concerning the correctness of the synonymy.

The first antennal joint is twice the length of the second, the third is composed of eight segments or annulations, as in *Neoxaireta*. The difference between the antennae of the genera is very readily perceived in the proportional lengths of these segments; in *Xanthoberis* the first five (segments 3-7) are extra large and the last three (8-10) minute, whilst in *Neoxaireta* all the segments of the third joint are moderately large and the apical one (10th) is longer than any of the preceding five.

Figs. c and d represent the apical abdominal segment and appendages of the genotype, and it will be noted that the cerci differ considerably from those of *Neoxaireta spiniger*; nevertheless they approach the cerci of other species belonging to the genus *Neoxaireta*.

**XANTHOBERIS SILIACEA White.**

*Xanthoberis siliacea* White, *loc. cit.*, p. 76; Hardy, *loc. cit.*, p. 41. .

*Apospasma famelicum* Enderlein, *loc. cit.*, p. 198.

From a comparison of the descriptions there can be no doubt concerning the correctness of the above synonymy.

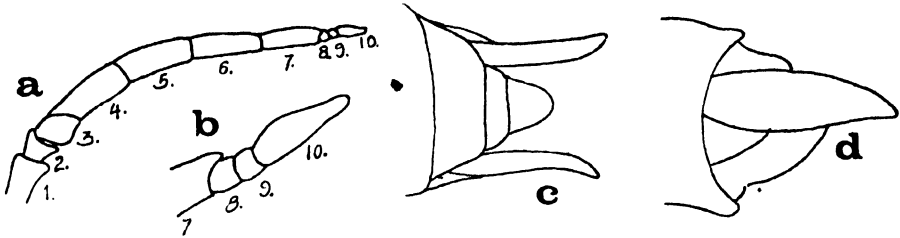


Fig. 388. *Xanthoberis siliacea* White. a. Antenna. b. The three apical segments of same enlarged. c. Apex of the abdomen, dorsal view. d. The same seen laterally.

White's description agrees with the holotype in the main: the antennae, however, are yellow and stained with fuscous, the three apical segments being black. The apex of the abdomen is blue-black dorsally (this same colour being indicated by irregularly placed occasional small spots on other parts of the dorsal area) and yellowish ventrally. Both White's and Enderlein's specimens were from New South Wales, and both authors described from a single female specimen.

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## ERRATA.

Page 282, for *Macrayonus* read *Macrogonus*.

Page 445, for *Sphrodtopoda* read *Sphodropoda*.

END OF VOL. II.





